THE MODEL ENGINEER

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THE MODEL ENGINEER

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Our Cover Picture

The set of three-abreast "galloping horses," by Mr. Herbert Slack, of Chapel-en-le-Frith, proved to be one of the most popular attractions of this year's "M.E." Exhibition, affording interest and amusement to both technical and non-technical observers. It has the authentic atmosphere of the old-time fairground, with its brilliant ornamentation, its steam-driven centre engine, and mechanical organ; although the pipes of the latter were mute, the use of disc records of real fairground music provided a most satisfactory substitute, detracting little if any from the realism. It is of interest to note that while this exhibit delighted old and young alike, the keenest appreciation was displayed by those old enough to recall the days when the annual country fair was an eagerly awaited red letter day, and the glamour of its simple attractions did not have to compete with the sophisticated diversions of modern times.

SMOKE RINGS

"Eileen the Erring"

WE DO not recall that the "M.E." Exhibition has ever in the past been honoured by a visit from a full-size traction engine; but one certainly arrived there on the opening day this year. It was *Eileen*, from Bray, Berks, and she made the 27-mile journey, each way, under her own steam, driven by her owner, Mr. G. Romanes and a mate. *Eileen* was in fine fettle, despite her 40 years of age, and she sported a little decoration in the form of a well-known advertisement calling attention to a popular beverage that, appropriately enough, is reputed to "fortify" those who partake of it no matter what their ages may be!

We deeply regretted that it was not possible to invite *Eileen* to enter the hall; so, after standing outside for a while with her flywheel gently revolving to that ever-fascinating "tufter-tufter-tufter," she recovered her decorum and, sadly disappointed, departed for home. Incidentally, the heading to this paragraph is the wording that now appears on *Eileen's* nameplate; her name is in bold capitals, while the other two words are what the printer calls "lower fount."

Smaller Models

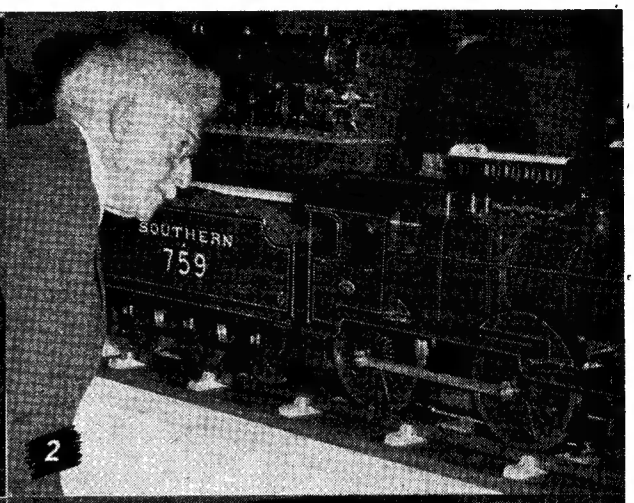
ON LOOKING round the exhibition this year, and in fact for the past few years, one wonders whether there is not a strong tendency to build smaller models. Taking the ship models—instead of the large and imposing square-riggers and liners we are used to, we see in these days a number of much smaller models. This year there are quite a number of square-riggers of only about a foot long, and only two of the larger ones. Miniature ship models seem to be more popular than ever.

It may be that the smaller house is having an influence, not to mention the effect of people having to live in flats and in rooms. Limited workshop accommodation certainly limits the size of models. A tendency to build smaller models does not, of course, indicate a decline in craftsmanship. On the contrary, the building of a miniature often calls for a much higher standard. Is there an explanation for this tendency, or does the idea exist only in our imagination? What do our readers think?

Models or Curios?

THE TERM "model" covers such a wide field that the selection of entries for the "M.E." Exhibition always presents a few problems, and not infrequently produces one or two surprises. Some of our critical visitors suggest that there should be a tightening of the rules regarding the eligibility of entries, so as to exclude exhibits which cannot be classed as within the legitimate bounds of model engineering. This raises some rather difficult issues, however, especially in view of the fact that the selectors have no exact foreknowledge of the nature of an exhibit before it actually appears at the Exhibition, except the particulars given on the entry form, which are often rather vague. An entry described as "a model of the *Santa Maria*" may turn out to be the sort of thing one sees in a pseudo-antique furniture shop, or it may be made of matchsticks or cheese labels. Some of the "borderline" exhibits which have appeared at "M.E." Exhibitions in the past have proved to be centres of attraction, and we feel that to exclude them would definitely detract from the wide variety of interest which is one of the features of the show. One of our main aims is to promote the exercise of amateur craftsmanship in every one of its many forms, and while we share the opinions of most of our readers on the undesirability of encouraging mere "arty-crafty" work which involves more superficial show than skill, we can think of no system of ruling which definitely eliminates this without the risk of losing worth-while models as well.

at the 'M.E.' Exhibition



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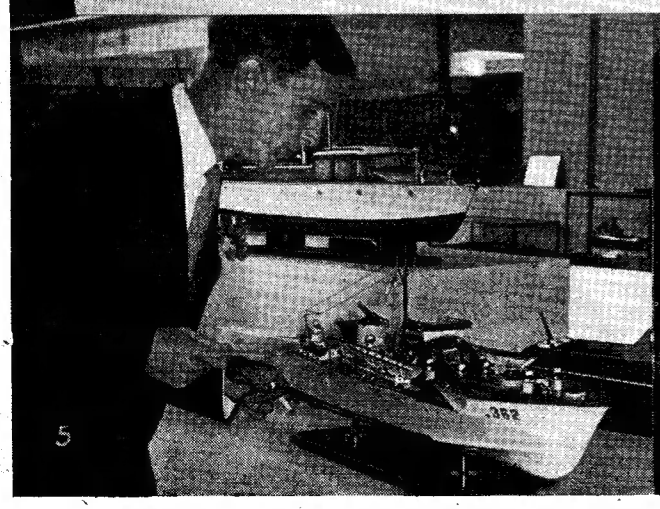

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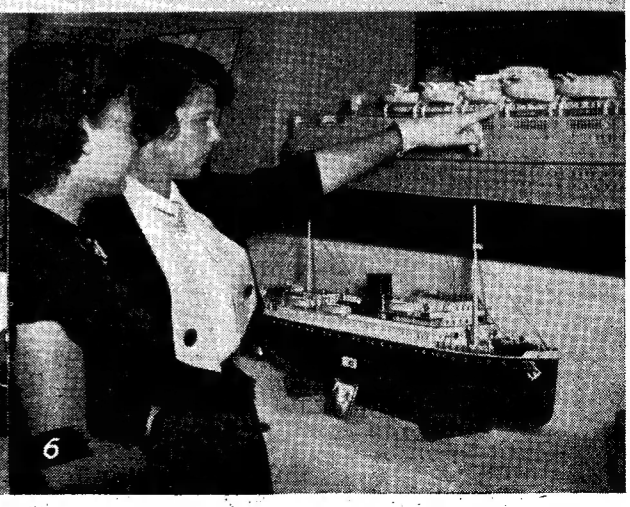

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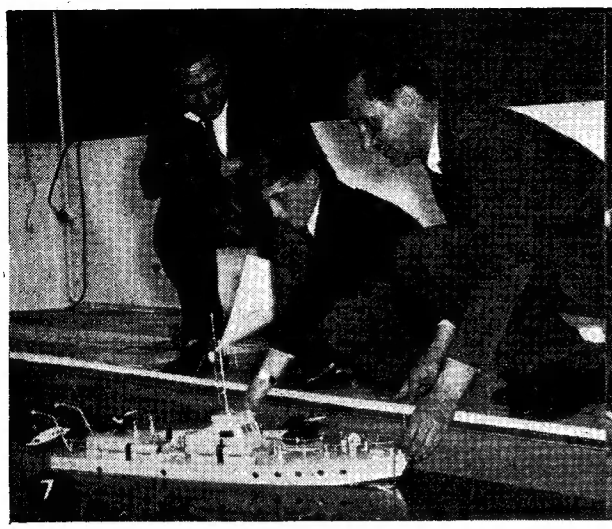


(1) The Cup-winning model by Z. A. Wojda of a Polish bomber, which has working controls and true-to-scale interior fittings.

(2) Mr. George Gentry examining one of the locomotives in the Competition section.

(3) A corner of the miniature ship models section.

(4) Mr. J. N. Maskelyne (centre) finds something pleasing in the miniature railway section.

(5) The Exhibition Manager, Mr. Gerald Withers, makes a check of the stand arrangements.

(6) Two lady visitors admire one of the large ship models.

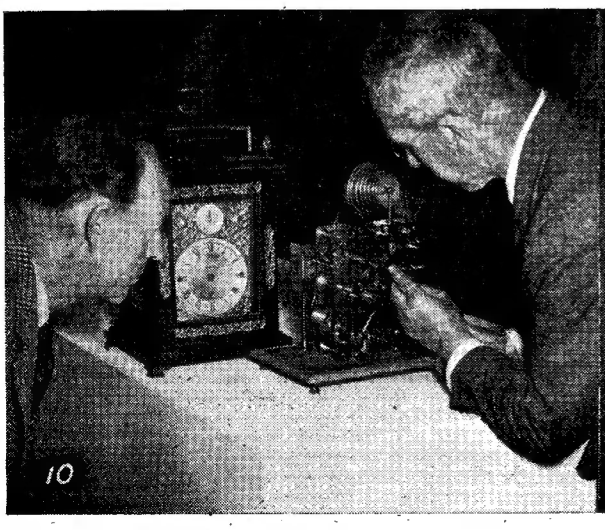
(7) Mr. George Sommerhoff launching one of the radio-control models on the demonstration tank.

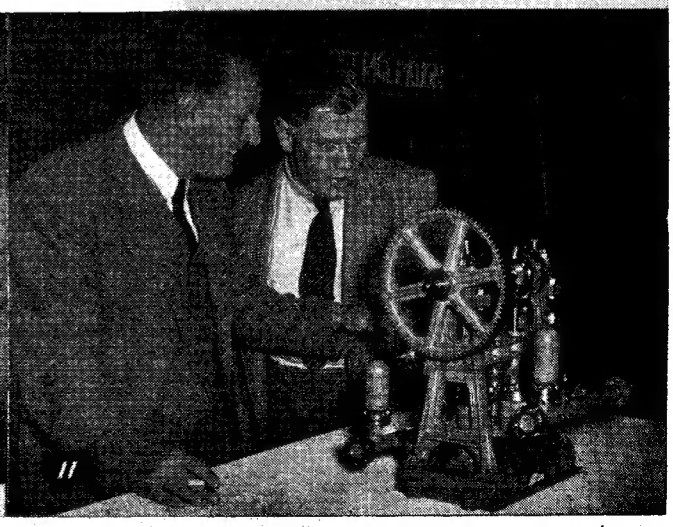
(8) Mr. Rex Hays and his assistant cleaning up a model racing car on the Grand Prix track.

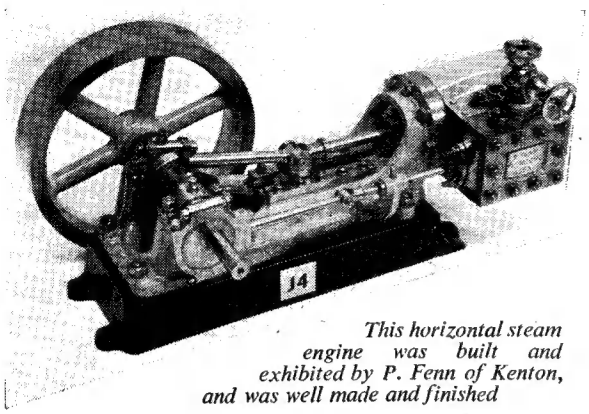
(9) One of the constructors of the Silver medal winning table engines, Mr. A. J. Kent, making final adjustments to the model.

(10) Mr. C. B. Reeve, constructor of the chiming bracket clock, explains its details to Mr. J. Message.

(11) Mr. Cecil Moore of Myford's, and Mr. Edgar T. Westbury discussing details of Mr. J. C. Snelling's three-throw pump.







This horizontal steam engine was built and exhibited by P. Fenn of Kenton, and was well made and finished

"NORTHERNER" Looks in at the MODEL ENGINEER EXHIBITION

MANY model engineers carry on their craft under difficulties, sometimes due to lack of equipment, sometimes to lack of spare cash, and occasionally to physical infirmity or affliction. When such difficulties are surmounted, either by grit or skill, or a combination of the two, the worker has every right to feel proud of his achievement.

But at this year's "Model Engineer" Exhibition, there was a piece of work which in that sense I have never seen surpassed. It was a model paddle steamer built by A. Bartlett, of London, who is both *totally deaf and blind*.

Consider for a moment what this means! There is a hull to be carved from the solid, and to be smoothed and faired off and made symmetrical. There are four star-shaped sides for the paddles, to be filed out of metal, and twelve floats to fit to these. And all this has to be done by touch! There are many holes to be drilled close and parallel to the edge of the deck, to take the fixing-screws and the stanchions. The latter are of wood, and not only have to be shaped up, with a dowel carved on the bottom end of each to fit into the fixing-hole, but also have to be drilled with two holes each, equally spaced to take the rails (which are made from basketry cane incidentally). Again it all has to be done by touch. And so one could go on.

But considering all this, and more, one could only be lost in admiration for Mr. Bartlett's splendid achievement. It is, indeed, one of which anyone might well be proud.

As at most exhibitions, ship-models predominated, and among the power-boats I noticed a very nice ½-in. scale motor torpedo-boat, built by V. R. Freeby of Hornchurch to the blueprints published by THE MODEL ENGINEER. It was well constructed, with a good smooth finish to the paintwork, and full of excellent detail. The engine-room layout was good too, with a water-cooled i.c. engine (which appeared to be converted from a commercial one.

Contrast

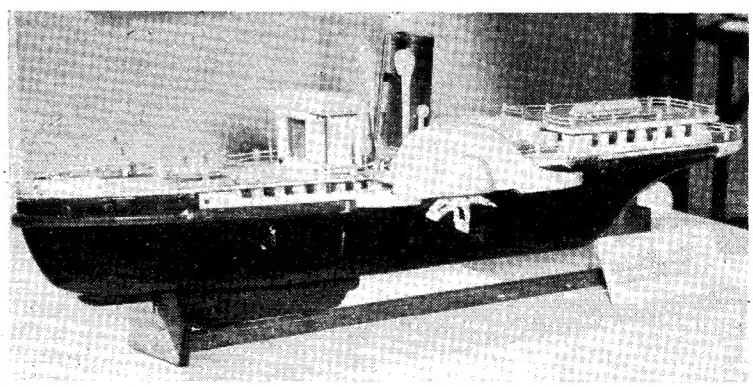
By contrast, there was another ½-in. scale Vosper M.T.B.—not from the same drawings—of which the paint was too thick, too glossy, and too highly-coloured. The lines of the paint-edges were uneven, and the "flag" bore little or no resemblance to the White Ensign which it purported to represent.

A 1/10th-scale launch had been submitted by I. Rimza, of Berwick-on-Tweed, and this was well finished, both inside and out, with a hull carved from the solid. It was fitted with a very neat water-cooled single-cylinder petrol engine, which appeared to be home constructed. A "black mark," however, is due for the countersunk and round-headed brass woodscrews used to secure the decks to the hull!

Scenic Models

There were many attractive scenic and miniature models, among them being an example of the lovely craftsmanship we have learned to expect from D. McNarry. It was not only the yacht-like hull lines of his anchored old-type liner which were so fascinating, nor yet the perfect detail, but such points as the ship's boat at the foot of the lowered accommodation ladder, and the dhow driving past in the foreground.

Another "scenic" was the small colonial shipyard of New England, entered by Major L. C. Britton, an American at present residing in London. In this, the skeleton of a two-masted schooner is taking shape on the slipway, while a similar completed vessel is being loaded



A very meritorious piece of work by A. Bartlett, who is both blind and deaf, this electrically propelled paddle steamer was greatly admired by everyone

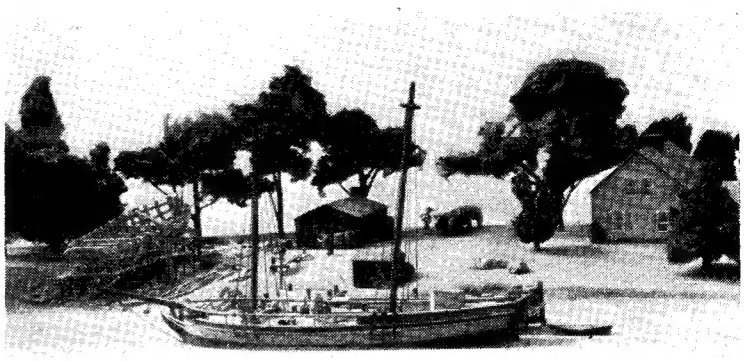
(or unloaded) at the jetty. A small homestead is nearby, with well, line of drying laundry, outhouse, and firewood billets, and in the background an ox-wagon is bringing more timber for the ship-building. A very attractive and unusual model.

In the same category came a $\frac{1}{8}$-in. scale model of a Thorneycroft cabin-cruiser, and a 50 ft. to the inch model of the s.s. *Pacific Unity*. The former, by A. S. Randall of Anerley, was depicted moored to the bank on the Broads, with fisherman, swimmers, and rowing-boat complete, while the latter, built by E. N. Taylor of Gosport, included the famous Barton aqueduct and swing-bridge which carry the canal and the road over the Manchester Ship Canal.

G. H. Draper, of Ilford, exhibited three $\frac{1}{4}$-in. scale naval boats, a 32-ft. barge of H.M.S. *Orion*, a 32-ft. galley of H.M.S. *Warspite*, and a 30-ft. gig of H.M.S. *Thunderer*. These were full of detail and a delicate craftsmanship, and the lines were superb.

Stationary Engines

The names of A. J. Kent and F. H. Tapper as collaborators are familiar by now in successive "M.E." Exhibition Catalogues: there was that very good Ransomes' showman's engine last year, and a Tangye engine, and a few years ago a beautiful pair of Ransomes' general-purpose traction-engines. This year they exhibited a table engine as built by R. Napier of Glasgow in 1851, the prototype being of 6 n.h.p., and the model to $1\frac{1}{2}$-in. scale. Built from authentic drawings, the model is well-finished, with the "castings"—which are mostly fabricated—made a dull black by chemical means. The bright parts are first-class too, and all the gibs, cotters, and other bits and pieces are just as they should be. The model is to go on indefinite loan to the Birmingham Museum; an honour which is well-deserved, and which I believe is shared by other work of these two craftsmen.



An American contribution to the Exhibition, this scenic miniature depicted a small shipbuilding yard in New England of 1800 *A.D. It was built by Major L. C. Britton, and was very Highly Commended by the Judges*

A further "period piece" was a 1-in. scale model of a Grasshopper engine of *circa* 1861, built by H. V. Davies of Morden. This too was well finished, and very well representative of its prototype.

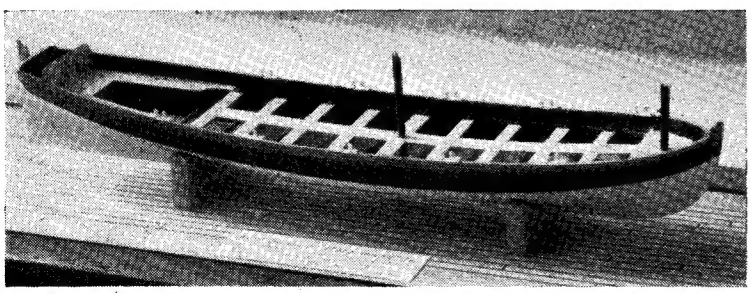
S. J. Bowles of London had chosen a "different" model, this being a vertical single-cylindered steam engine of 1-in. bore by 1-in. stroke, coupled to a large centrifugal ventilating fan. The engine itself was of more or less orthodox design, with a cast column at the rear and two turned ones at the front. Lubrication was well arranged with an automatic lubricator (driven from the valve eccentric) for the cylinder, syphons for the main bearings, and an oil-box with five separate diminutive screw-down valves for the guide-bars, cross-head, and big- and little-end bearings.

Both fan and casing were neatly fabricated from thin sheet metal—presumably steel—and the finish of the whole model was good, except that the paint on the engine bedplate could have been smoother.

What might be termed a "gas-engine" type of petrol engine—if that is not too contradictory—was shown by H. Dewhirst of Baildon. It was of course horizontal and water-cooled; the bright parts bore an excellent finish, but the paintwork was a little on the rough side. The rim of the fly-wheel, too, had two or three shallow blowholes, which an extra 1/32-in. machining would probably have cleared, with little if any detriment to the engine's performance.

Just as the two M.T.B.'s previously mentioned showed a contrast in the finish, there were two horizontal engines close together which did the same. The first, by P. Fenn of London, was from commercial castings, and was nicely made, with a good compression and a good finish to both brightwork and painting. (At the same time it would have looked better with governor and water-pump added.)

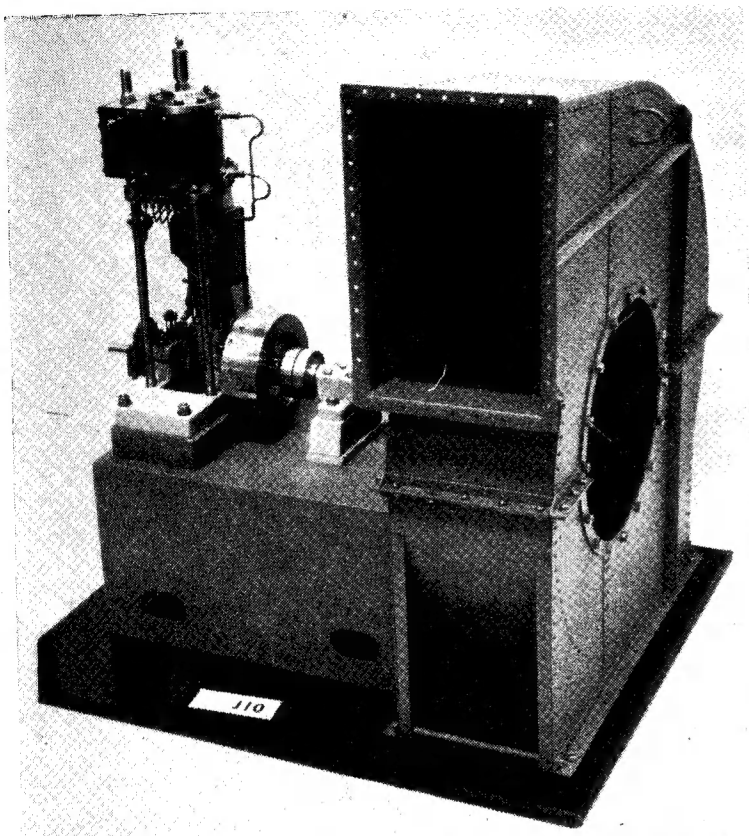
The second engine had an overhead valve, worked by rocking lever. It was mounted on a plain piece of $\frac{3}{16}$-in. steel plate, and it appeared that the main bearing pedestals were cut from thicker plate. The chief trouble regarding the appearance, however, was that the unpainted steel plate was literally pitted with rust marks. True, these were only shallow, but they could have been removed quite easily before sending the model for exhibition, and a few coats of paint, carefully applied, would have improved the appearance greatly.



G. H. Draper of Ilford exhibited three small naval boats of different periods. This one is the 32*-foot barge of H.M.S. "Orion," a "*74*" of* 1800 *A.D., the three boats together won a Silver Medal*

A Locomotive in Cardboard

A G.W.R. "King" class locomotive, built in cardboard by D. A. Dubbin of London, was to



A steam-driven centrifugal fan built by S. J. Bowles of London, the engine having a bore and stroke of 1-in. Note the comprehensive lubrication arrangements

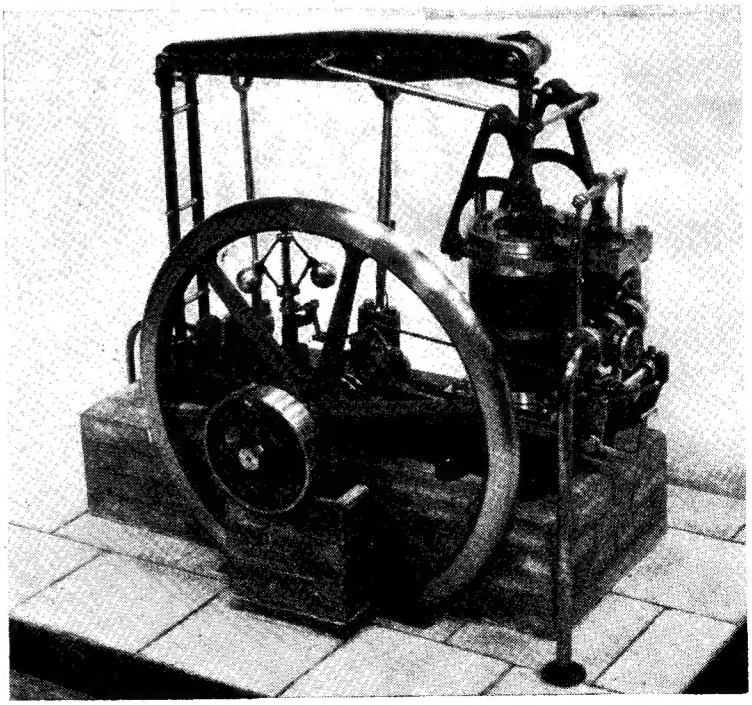
me chiefly remarkable for the fact that it *was* of cardboard. Allowing for this, it was a good model, but compared with what it might have been in correct materials, it was but mediocre.

The builder had obviously used great patience and perseverance in manipulating his material, but I felt—and was not alone in this—that had he put a little more time into using metal, he would have achieved not only a more satisfactory result, but much more personal satisfaction besides. The model could still have been a dummy, if lack of equipment and cost were very important factors.

Especially interesting to ladies and children, as well as to many of the more sophisticated model engineer visitors, were a row of five shops built by T. A. Thompson of Hornchurch. They were a grocer's, stationer and tobacconist's, fruit and vegetable shop, sweet shop, and baker and confectioner.

Mr. Thompson had gone to infinite trouble to create the correct atmosphere, and the model or models, must have contained thousands of separate items. There were (among other things) cases of tea, cheeses, bottles of pickles, tobacco-pipes, bottles of ink, cartons of crayons, oranges, apples, pears, grapes, chocolates and toffees, bars of chocolate, an iced wedding-cake, loaves, tarts, doughnuts, and custard-pies. In addition to the window-displays, the interiors of the shops were also set out, by the way.

Atmosphere was also well achieved in R. G. Foster's station buildings for "Market Norton," a small imaginary market town of early Edwardian period. To some extent this was achieved by the use of period costume on the human figures on the platforms—the guardsman in scarlet jacket and pillbox cap, the bearded gentlemen in frock-coats, and the ladies with flowing skirts. If Mr. Foster obtains the same illusion throughout his 4 mm. system, it will be well worth seeing in its entirety.



Right—Another well-built and nicely-finished steam-engine was this inch-scale "Grasshopper," by H. V. Davies of Morden

Two of the row of five shops which were built by T. A. Thompson of Hornchurch, this entry was Very Highly Commended by the Judges, also. Many hundreds of toffees, chocolates, cakes, etc., were all separately modelled

Other Highlights

This report has only touched on a few of the features of the Exhibition, of course, and there were many other exhibits worthy of close study. For example, there was the research microscope designed and built by Lawrence H. Sparey, which he is currently describing in THE MODEL ENGINEER. This had an excellent finish in black cellulose which he told me was done with a home-made " M.E." spray-gun.

In the same show-case was the bogie for D. G. Webster's *Dean* single-wheeler, which bids fair to being a real masterpiece when it is finished. Among the ship-models was the radio-controlled cruiser H.M.S. *Curacoa* built with fine detail by Norman Ough. I was fortunate enough to have a long chat with Mr. Ough, and learnt much about radio-control and naval ships in general, from this master of both.

And finally, J. S. Youngman's 1-in. scale model of the old *Puffing Billy* locomotive, which really *looked* as if it might have spent its life in hauling colliery waggons about ! The one drawback was that it wasn't steam-driven, but even so, it was a very fine job and worthy of a prolonged inspection.

FOR THE BOOKSHELF

Sailing Trawlers, by Edgar J. March, M.S.N.R. (London : Percival Marshall & Co. Ltd.) 384 pages, size 7 in. by 9½ in. Copiously illustrated in halftone and line. Price £3 3s. 0d. net.

Not so many years ago, ports on the east and south coasts of England, one in the Shetland Islands, and at least one actually within the London boundary, stabled fleets of sailing trawlers on which the fish markets relied for supplies of cod. These picturesque little craft, like their contemporaries the sailing barges and drifters, are now extinct; the very few that still remain have been converted into private yachts and pleasure boats, their original functions having been superseded by more modern means. Mr. March's two previous books, *Spritsail Barges of Thames and Medway* and *Sailing Drifters* are classics of their kind and have established their author as one of our foremost writers in his particular field. This third book, *Sailing Trawlers,* undoubtedly confirms that reputation, for it is the largest and most comprehensive of the three.

The text extends to thirteen chapters, and from the historical and practical points of view is descriptive and informative. The little ships themselves, as well as their equipment, are described in great detail ; there are dramatic stories of disasters that beset these craft at sea; there are stories of prosperity and slump, and there are many lighter moments. But all are written by one whose very soul seems to be in the sea and everything connected with it.

With all this there is the great wealth of illustrations, not one of which is superfluous. They consist of some fifty detail sketches by the author, eighteen scale plans, and no fewer than 180 halftone reproductions each with its own significance, many of them unique, while the sheer intrinsic beauty of some of them is more than striking.

The scenes and events that are set down in these pages now belong to past history; but they are recorded in faultless manner by one whose enthusiasm for and sympathy with his subject are unbounded and, therefore, infectious.

The Armstrongs of the Great Western, by H. Holcroft. (London: Railway World Ltd.). 140 pages, size 5½ in. by 7½ in. One plate in colour; 18 art-paper inserts. Price 15s. net.

Perhaps more than any other English railway of the pre-nationalisation era, the Great Western Railway was a " family " affair with a strongly marked individualism; in all grades of its staff, sons and daughters succeeded their parents during three, and even four, generations, and this without question, had its effect upon the efficiency and progress of the whole organisation.

Curiously enough, however, no very comprehensive record has, up to now, been published concerning one of the most important families connected with Great Western history—the Armstrongs, three generations of which served the G.W.R. during a period of ninety-two years, 1854-1946, chiefly associated with the locomotive department. Mr. H. Holcroft, himself a native of Wolverhampton, where the Armstrong influence was greatest, has written this book and so filled a gap that has been allowed to exist too long. The text has been written from personal knowledge gained through long association with the Armstrong family, and therefore bears the stamp of authority and intimacy ; it is illustrated by some forty-two line blocks including locomotives, maps, plans and drawings.

The halftone illustrations include numerous locomotives, family portraits, old pictures, places and objects of interest. The coloured plate depicts engine No. 700, a standard Armstrong 0-6-0 goods as rebuilt and painted at Wolverhampton in 1885. Mr. Holcroft has achieved a nice balance between the personal and locomotive interests in his story, and his book is surely destined to take its place in the forefront of historical railway literature.

QUERIES AND REPLIES

" THE M.E." FREE ADVICE SERVICE. Queries from readers on matters connected with model engineering are replied to by post as promptly as possible. If considered of general interest the query and reply may also be published on this page. The following rules must, however, be complied with:

(1) Queries must be of a practical nature on subjects within the scope of this journal.
(2) Only queries which admit of a reasonably brief reply can be dealt with.
(3) Queries should not be sent under the same cover as any other communication.
(4) Queries involving the buying, selling, or valuation of models or equipment, or hypothetical queries such as examination questions, cannot be answered.
(5) A stamped addressed envelope must accompany each query.
(6) Envelopes must be marked " Query " and be addressed to THE MODEL ENGINEER, 19-20, Noel Street, London, W.1.

Camera Construction

I understand that several articles have appeared in THE MODEL ENGINEER *on the construction of 35 mm. cameras. Will you please advise me of the dates of any issues containing these articles?*

J.M. (Sheffield, 7).

The following issues of THE MODEL ENGINEER contain articles on 35 mm. camera construction :—

" Notes on the Design of a 35 mm. Camera," by Raymond F. Stock, which appeared in the issues dated August 23rd and September 6th, 1951.

" An Inexpensive 35 mm. Camera," by John R. Russell which appeared in the December 21st, 1950 issue.

" A 35 mm. Camera and Flash Gun," by G. Pratt in April 16th and 23rd, 1953 issues.

Aerolite Glue

Some time ago you made an announcement in THE MODEL ENGINEER *regarding Aerolite Wood Glue which, it was stated, would be on sale through ironmongers, etc. Although I have made fairly wide enquiries, I have been unable to obtain any, and I should be glad if you would let me know the name of any stockists in London, or, alternatively, the address of Messrs. Aero Research Ltd., so that I can make application direct.*

S.T.G. (London, S.W.9).

Aerolite Wood Glue can be obtained from Aero Research Ltd., Duxford, Cambridgeshire. We regret that we do not know of any local suppliers of this glue.

4-stroke Petrol Engines

I have read your handbook " Model Petrol Engines," by Edgar T. Westbury, and am very interested in the descriptions of model 4-stroke engines. Will you please answer the following questions :—

Are detailed drawings of these engines or other 4-stroke engines not described in the book obtainable? I require engines of a capacity not higher than 15 c.c. Where can drawings be obtained, and are castings for the engines available?

J.R. (Amsterdam).

Drawings of several of the 4-stroke engines described in this book are obtainable from our publishing department in addition to a number of others which have been designed since the book was published.

Most of these engines are of a capacity not higher than 15 c.c.

Castings for some of the engines can be obtained from " M.E." advertisers, including Messrs. G. Kennion & Co., 32, Kingsland Road, London, E.2, and Craftsmanship Models Ltd., Norfolk Works, Ipswich.

Proposed Loco Reconstruction

I have recently purchased an 8-in. gauge railway outfit consisting of a locomotive, three trucks and fifty yards of track.

The locomotive is a 4-4-0 but the driving wheels are rather too large, so I am considering rebuilding it to 7¼-in. gauge 0-6-0. Could you tell me where I could obtain drawings for a Joy's valve-gear and inside cylinder motion work? I am rebuilding this locomotive to the model of a Lancashire and Yorkshire 0-6-0 Aspinall goods engine.

Could you recommend a firm who could supply the necessary wheel castings?

I shall have to rebuild the boiler owing to the firebox being too large, it is steel with copper tubes.

When rebuilding, could I sleeve the boiler and line the outside of the firebox with copper in order to stop corrosion, or is this not practicable owing to different expansions of the metal?

G.H.C. (Chorley).

Why go to all this trouble? We do not understand how you arrived at the decision that the driving wheels are too large. Surely if this is the case, the simplest remedy is to replace them with smaller ones. To make all the modifications you suggest, even if they could be readily done, would probably lead you into much greater trouble. For example, the fact that you have chosen the Aspinall 0-6-0 as the prototype of your rebuild suggests that the engine already has a small boiler; therefore, if you reduce the gauge from 8-in. to 7¼-in. you will have to reduce the width of the firebox, and thereby court disaster, so far as the steaming is concerned.

Your idea for sleeving the boiler and lining the outside of the firebox with copper is incomprehensible to us, and we do not see how it would stop corrosion. Our advice is that you should leave the engine as it is and be content with what performance you can get out of it.

Lathe Lubrication

I have just purchased my first lathe second-hand. It is a small lathe having a mandrel ½ in. diameter running in half-split adjustable cast-iron bearings. I would be greatly obliged if you would let me know the best oil to use for lubricating these bearings.

R.G.F. (Luton).

Any light mineral lubricating oil of good quality will be quite suitable, the essential thing being that it should flow freely with no tendency to gum up or to cause any chemical action.

The grade of oil generally employed is what is known in the trade as " spindle oil." Generally speaking, heavy or viscous oils, such as motor lubricating oils, are less suitable for lathe lubrication than the lighter oils, though they have been used with success. We have used Shell Vitrea oil for some years, and can recommend this from personal experience.

Boiler Protection

I have a steam boiler, 2 ft × 11½ in. diameter, which I use about once a month. Can you advise me which is the better way to protect the boiler from internal corrosion, whether it is better to drain it off or keep it full?

K.G.S. (Teignmouth).

Your boiler can be protected from corrosion either by draining and drying out the boiler completely, or by filling it completely full of water so as to leave no air space whatever inside the boiler. Generally speaking, the second method is the only one practicable in cases where boilers are used intermittently, as it is extremely difficult to ensure the complete removal of all water vapour from the shell.

READERS' LETTERS

Letters of general interest on all subjects relating to model engineering are welcomed. A nom-de-plume may be used if desired, but the name and address of the sender must accompany the letter. The Managing Editor does not accept responsibility for the views expressed by correspondents.

CYLINDER LATCHES

DEAR SIR,—I was very interested in Mr. Capps's article on the above subject, and would like to add details of my work on them.

It is very inconvenient, particularly in the dark, to have to find the correct key for any lock when several are carried on the key ring. To get over this I have altered all my latches to take the same key, this is quite easy, provided they are all of the same make. I have altered three and now have one key which fits front and back doors, garden gate and my caravan.

First pick the key which is broadest over the plunger positions. Take the latch which is to be altered, remove the split washer and operating bar, insert its present key, and then carefully push the cylinder out of the body with a $\frac{1}{2}$-in. dowel or shank of a drill. This prevents the top plungers falling down.

Insert the key you wish to use in the cylinder and change over the plungers until they all stand proud. This is the reason for choosing a broad key. Carefully file all the plungers until they are the same height as the cylinder, then remove the plungers one by one and round off the filed end, taking care not to alter the total length.

Leaving in the key, replace the cylinder in the body, pushing out the dowel as you do so, replace the operating bar and split washer.

Yours faithfully,

Barnsley. J. HEPTONSTALL.

RENEWING BEARINGS

DEAR SIR,—Referring to the Queries reply on this subject in the issue dated 30/7/53, p. 147, there is a means most economical in time and equipment that serves some cases.

Bore the worn frames oversize if sufficiently enlarged, even this is not necessary. Position and align shafts with gears assembled, on temporary supports. Pack asbestos sheet gaskets against the inner side of frames to seal the bores; secure with clay. Gaskets on the other face have a hole at the top around which the clay is cupped. Preheat the bearing area to about boiling point with torch or blowlamp. Into the cavity pour molten "Cerromatix" alloy (pouring temperature 350 deg. F.; melting point 248 deg. F.). Radial drillings in the bores will key the cast bush, although it will be tight enough with 0.002 in. per inch expansion on setting. Compressive strength is about 8,000 lb./sq. in.

Yours faithfully,

Bristol W. T. ARNOT.

The method described by our correspondent is one which is fairly well known in industry and is used not only in repair work but also for the location of shaft bearings in new machinery. There is no doubt of its practicability in the circumstances referred to, but it is necessary to provide means of ensuring that the low melting-point alloy, which, as stated expands on cooling, does not tighten on to the shafts as well as into the frames. The usual method is to fit bronze bushes to the shafts, to a normal running fit, and chamber out the housings large enough to enable the metal to be poured in. For new machines, cored holes in the frame castings eliminate the need for machining these components, but the work involved in boring out the housings when reconditioning old bearings may be greater than that in the methods we have outlined—ED., "M.E.")

IGNITION IN MODEL PETROL ENGINES

DEAR SIR,—In the description of his beautiful little six-cylinder engine, recently published in THE MODEL ENGINEER, I notice that Mr. Waterton mentions the oiling up of sparking-plugs. Perhaps my own experiences in connection with the ignition of my 4-cylinder "Seal" will be of interest to Mr. Waterton and other owners of multis.

I have found that the tendency of plugs to oil up is greatly minimised by arranging the polarity of the ignition system one way—namely, negative to earth; and, in fact the effect is so marked that smooth running is impossible on the "Seal" unless the polarity is thus. The effect is equally pronounced, whether coil or magneto ignition is in use; and with a 2-pole magneto driven at engine speed, one can have either cylinders, Nos. 1 and 4, or Nos. 2 and 3 missing to choice, according to which way the magneto is timed. To avoid this trouble, I have used a gearbox to drive the magneto at twice engine speed, and as an alternative I have recently built a 4-pole machine of "Westbury" type which does the job nicely at engine speed.

Though the cylinder compression is good using ringless pistons, the engine is somewhat oily, and no doubt this accentuates the effect. Needless to say, both the condenser and contact points have been replaced in an effort to find an explanation of this phenomenon, and the spark intensity, as checked by an oscilloscope, is equal when the polarity is either way.

It appears, therefore, that the effect is caused in some way by the plugs themselves; (Lodge plugs are normally used, but other types react in a similar manner) and may perhaps be due to the different compositions of the electrodes.

I believe that the normal earthed positive ignition systems used on motor-cars are arranged this way for reasons not unconnected with plug performance and adjustment of the electrodes, and I should be extremely interested if any of your readers can throw further light on this subject.

Yours faithfully,

Bickley. R. H. R. CURWEN.

DIE CASTINGS

DEAR SIR,—With reference to the matter referred to by Mr. K. N Harris in the issue of THE MODEL ENGINEER for May 7th, 1953 relative to the unsuitability of die castings for certain purposes, you may be interested to know that as long ago as 1915, the Automatic Electric Co. of Chicago abandoned the use of die-castings (zinc-base) for the frames of their automatic telephone selection switches in favour of cast-iron, on account of the adverse effects on switch adjustments of the growth and warping of the die-cast frames. I experienced a similar effect on the jointed tone arm of a phonograph, where the joint seized up due to growth of the die-cast components.

Yours faithfully,

C. H. CHRISTOPHER

Victoria, Australia.

L.B.S.C.'s Lobby Chat

AN IRISH "JULIET"

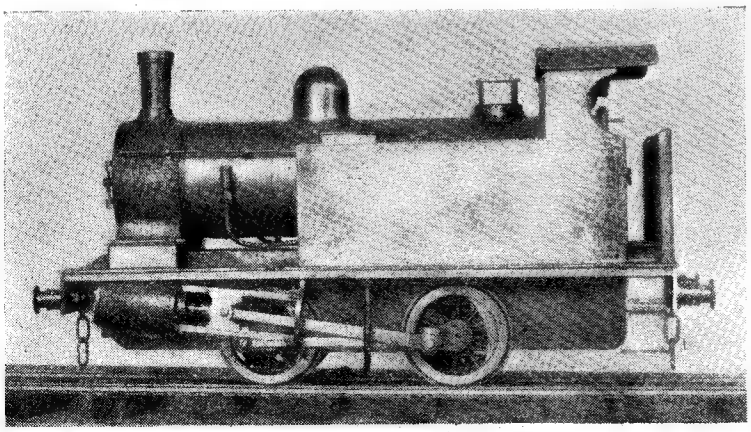
ONE wouldn't expect to find much doing in the way of small locomotive building in the extreme south-west corner of Ireland —or rather Eire—associated with the Rose of Tralee, Lakes of Killarney, and Macgillicuddy's Reeks; but nevertheless, the Rose's home town was also the birthplace of *Brigid*, shown in the accompanying photographs. She is a *Juliet*-type engine, built by a member of the surgical profession who is too shy to be introduced to the followers of these notes by his baptismal moniker; he says I'd better call him "Bro. Sawbones"! Whether his skill in sawing bones, and carving up other sundry parts of the human anatomy, has anything to do with his skill as a locomotive builder, is something I don't quite know; but anyhow, if the latter is an indication of the former, I shouldn't have the slightest hesitation in availing myself of his professional services should same be required!

There is no need to describe the engine fully, as she follows the published specification except for slight variations in detail. At present she has no road on which to show her paces, but this is under construction; an elevated line of the usual type, mounted on concrete posts which our friend is casting himself. *Brigid* was shown at the exhibition of "Doctors' Hobbies" which took place in Dublin last year, when the annual general meeting of the British Medical Association was held there. Incidentally, the engine was named after one of four daughters—I'll bet the others were jealous!—and our friend says that she (the engine, not the daughter) now has a serious rival in the shape of a competition motorcycle, on which he gets plenty of fun and exercise in riding up and down the mountain roads, of which there are plenty in those parts. I sincerely hope that he exercises plenty of caution, too, as I'd just hate to hear of four lovely "Roses of Tralee" in mourning! Anyway, congratulations to "Bro. Sawbones" on an excellent job of work.

Sussex beats Kent

This might be mistaken for cricket news; but not this time! I fully expected that the first picture of a finished *Invicta* would come from the county where not-so-big sister first astonished the natives; but Mr. S. Reeves, of Chichester, Sussex, has beaten them to it, the reproduced photograph protraying his engine, finished all except painting. The tender, as I surmised, matches up with the engine very well. I certainly prefer the Kentish gee-gee on the side, to the poor animal illustrated on the tenders and tanks of British Railways locomotives, which looks as though it hailed from the land of the Sphinx and the Suez Canal. Friend Reeves certainly deserves high commendation for his effort, especially as he, like your humble servant, is far advanced along the Great Railroad of Life. However, that fact hasn't deterred him from contemplating an early start on the *Titfield Thunderbolt*, as a suitable "encore." The hours spent on the little engine up to the time the photograph was taken, totalled 1032, which is jolly good going.

Good reports of these little "old irons" are still coming in. One reader in Lancashire says, that he tested his chassis by mounting a small oxygen cylinder on it, the contents running the engine for half-an-hour, at a cost of 3s.4d. Rather expensive running—but he will make up for it when the engine is finished, as running costs will then be negligible. One of the advantages of a little coal-fired locomotive is the low running cost, even at the present exorbitant price of steam coal. When I was a small kiddy, the running cost of my toy *Ajax* was a perpetual headache. In those days, methylated spirit was 4d. per pint, and I had to run errands for neighbouring housewives, and do all kinds of little jobs, to get the wherewithal to purchase even that amount. It didn't last long, either; *Ajax's* solitary burner was very thirsty. However, it is an ill wind that blows no good; I was stimulated by need, to try and make a locomotive with a more efficient boiler. That was the first step towards the boilers that I build and describe today—nuff sed!



"Brigid" of Tralee by Bro. Sawbones

Metric Measurements?

A correspondent who occasionally writes to me from the Continent, suggests that I should give metric measurements, as well as inches and fractions thereof, when describing the building of a locomotive, in order to assist any Continental

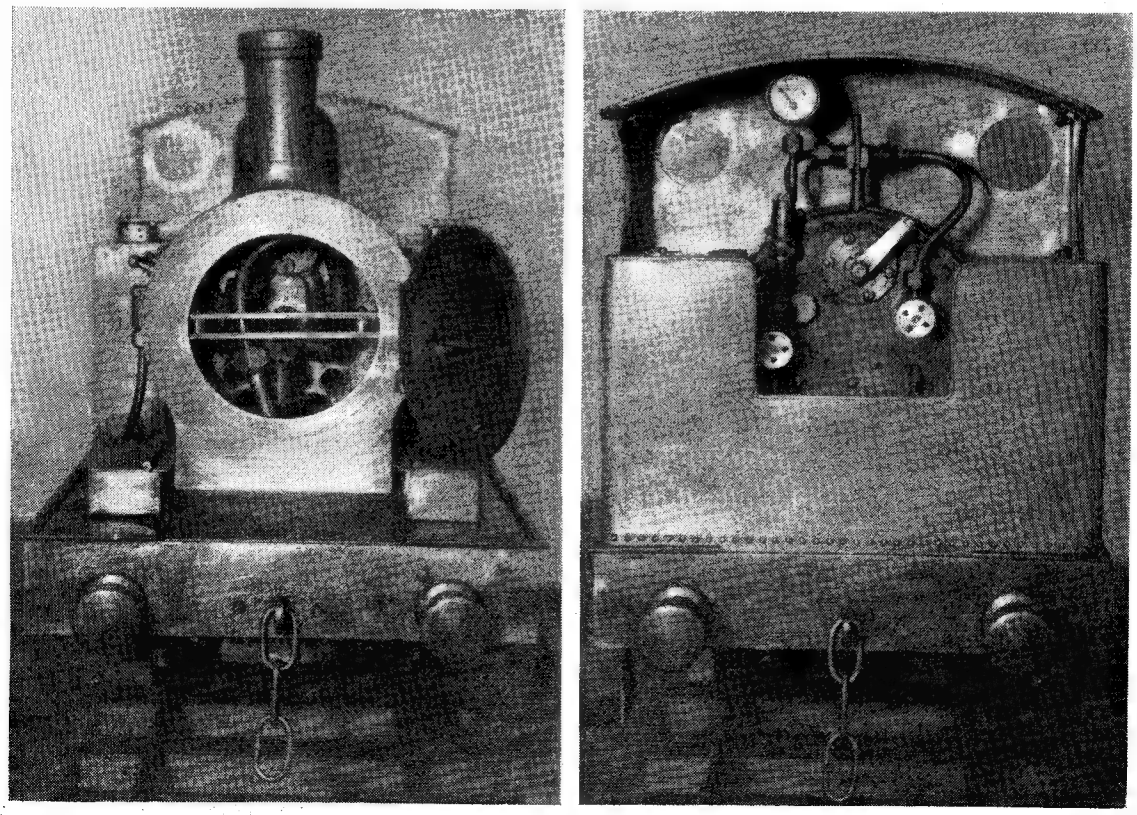
builders who may follow these notes. Well, in the first place it would be rather awkward to convert exactly, all the fractional sizes to metric, as the equivalent of 1 in. is 25.4 mm. and there would be plenty of decimals when we got down to sixty-fourths. Secondly, the few Continental builders who work to my instructions, seem to have no difficulty in following the fractional dimensions given in the drawings. Anybody who wishes to work to metric measurements could easily consult a conversion table, examples of which can always be found in the "engineering pocket-books" published by various firms, and also in many engineers' pocket diaries.

At the same time, I don't for one minute deny the advantages of working to *purely* metric measurements; I had plenty of experience of that, when running a small munition shop during the latter part of the Kaiser's war. I soon found that multiples of 10 were far easier to calculate, than sixty-fourths; also, millimetre "mikes" were far easier to read than fractional ones. However, I've often had a chuckle at the attempt of a locomotive designer of days now past, who endeavoured to "mix the breeds" in a manner of speaking, and specified dimensions such as cylinders "$\frac{7}{16}$ in. bore × 20 mm. stroke." Incidentally a correspondent in U.S.A. informs me that he has been asked to write a description of an American type $3\frac{1}{2}$ in. gauge 2-8-2, giving all the measurements in millimetres, for the benefit of some builders in France. He doesn't say in what journal he proposes to publish his articles, but naively says that he hopes that I won't be offended if he copies my style. I noticed that he wrote "$3\frac{1}{2}$ in. gauge "—*not* 88.9 mm. ! !

Gauge "1" Boilers

As I have remarked on previous occasions, it is curious how queries sometimes "interlock," and I've just had another experience of this. A reader wants to build the *Wee Dot like Doris* with a coal-fired boiler, keeping to the 4-6-0 wheel arrangement. This was the Gauge "1" engine I described several years ago, which was similar to a L.M.S. class "5," and was spirit-fired with a watertube boiler. I also gave a 4-6-2 version of it, with a coal-fired boiler, but our friend says that this would be too long for his curves, trackage space being severely limited; hence his desire to keep to the 4-6-0 design. If the coal-fired boiler is a practical proposition, what about feeding it? Would the pump specified for the 4-6-2 be too big?

Another querist has a gauge "1" "scenic" railway. He *has* built *Dot*, but has found that owing to inexperienced workmanship, valve setting, and other causes, the engine mops up plenty of steam, and the boiler needs frequent pumping up with the hand-pump in the tender. In an endeavour to get over this, he fitted a commercially-made eccentric-driven pump of $\frac{1}{4}$ in. bore, which promptly "knocked the boiler stony" as soon as it commenced to feed. He asks what can be done to enable the engine to run continuously without attention, and without losing



Front end and cab view of "Brigid"

pressure. He paid a very considerable sum to a firm, who made alterations to the engine without effecting any improvement; it still loses pressure with the pump on, and he has been told that the only remedy is a bigger boiler.

An Actual Example

Dealing with "first things first," not only can the *Dot* be fitted with a loco-type boiler, but it has actually been done successfully, on a similar-sized engine, and without any assistance from your humble servant, by a West London reader, Mr. J. Farrant. He just employed my principles and his own good common sense. In a long and cheery letter, he says he knew nothing about steam locomotive building, or even about machine work at all; but he read my notes for some years, and eventually "got bitten." He bought a small lathe, and a neighbour showed him how to fit chucks, and so he soon began to learn.

About this time, the notes on the *Dot* appeared; and, thought he, "this is right up my street." One attraction was my assertion that the engine would pull 20 coaches on a "scenic" railway—an underestimate, as he proved later—and then he discovered that I had also described a gauge "1" "County" class 4-6-0, and that blueprints were available for it. Being a Great Western fan, he combined the two; bought the blueprints of the G.W.R. engine, and used the *Dot* notes to build it.

However, no sooner did he make a start, that his young son wanted to know if he would be able to shovel the coal on; and our friend himself being rather partial to the idea of a coal-fired boiler, he decided to fit one, basing it on my notes. The overall dimensions, and the firebox shell, were made to the original sizes as given, but the barrel contained five $\frac{5}{16}$ in. tubes, and one $\frac{3}{8}$ in. flue, with the usual firebox and grate. This boiler was duly completed and erected, and in due course, was ready for test. The good lady of the house was tactfully invited to go to the pictures, and a friend came along to give a hand. The suction pipe of the domestic vacuum-cleaner was put over the chimney, and the fun began. Neither of the conspirators had had any previous experience in getting up steam on a weeny boiler, and the result was, that they spent $1\frac{1}{2}$ hours in trying to get the fire to burn and make steam, on coal from the domestic scuttle. The return of the good lady put an end to the proceedings—and *did* she say a mouthful at finding the dining-room full of smoke and blacks ! !

Experience Teaches

Our friend was naturally a bit downhearted, and put the engine aside for awhile, thinking that he had been too optimistic; so nothing more was done for some time. Then he happened to see some charcoal for sale at the local hardware store, and remembered that he had heard that charcoal would burn very easily; so he bought some, and decided to have another shot at getting up steam on the engine. He had also seen steam raised on large engines, by pumping air into the boiler and using the engine's own blower, so this time he tried the same wheeze with a cycle pump attached to the hand-pump union. To his great delight, steam was up in a few minutes, and there was no trouble in maintaining the pressure; but our friend found that he couldn't put the shovel down. She mopped up the fuel like a spam can. He applied to the local coal merchant for some steam coal, and that worthy sold him some Yorkshire steam coal, Shipley Peas, to be exact, and said that it wouldn't make much smoke.

Before a track test could be made, the tender had to be finished, and a temporary line laid. On trying the engine with the steam coal, he had no trouble in keeping the fire going, although the coal was far from smokeless; and he was overjoyed when the engine proceeded to puff up and down in fine style. Being now anxious to find out if she would pull a load, he rigged up a temporary four-wheeled flat car, something like the old original that I made at Norbury, with little ball-bearings sunk in wooden blocks. On the next trial, the engine pulled this easily, with our friend's little boy as a passenger; and she kept going for two hours, when the tubes became choked. Then the scene was set for the grand finale.

A few days after, the friend who had assisted in the first unsuccessful test, came along again, and they proceeded to get up steam, now an easy job; everything is easy when you know how ! Some bird-sand was put on the rails, and rolled in with the car; our friend said they needed some balancing practice before they tried to ride behind the engine. Meanwhile a new spring had been fitted to the safety-valve, and when this lifted, the steam gauge was showing 95 lb. so our friend sat on the car, and opened the regulator. Off went the engine; and as his weight is $10\frac{1}{2}$ stone, he said to his pal: "This is just fantastic" ! But more was coming. The pal, who happens to be a mounted policeman weighing $13\frac{1}{2}$ stone, then managed to balance himself on the little car; and on opening up, the wheels bit the sanded rails, and away went the little gauge "1" "County" without slipping, still accelerating at the end of the short bit of line. She did the pushing act equally well, except for shoving the tender off the road at a bad joint. Our friend was in the seventh heaven of delight at the crowning of his efforts with success, and says that after that experience, anybody who can't keep steam with the bigger firebox of a $2\frac{1}{2}$ in. gauge locomotive, must be a Billy Muggins indeed !

The above experience should reassure our brother who wants to build a coal-fired *Dot*, that it *can* be done all right; but at the same time, I wouldn't recommend a coal-fired boiler for "scenic" work, as the weeny fire needs plenty of attention, same as in full size. I found that out many years ago, in my early experiments with narrow fireboxes on gauge "1" engines.

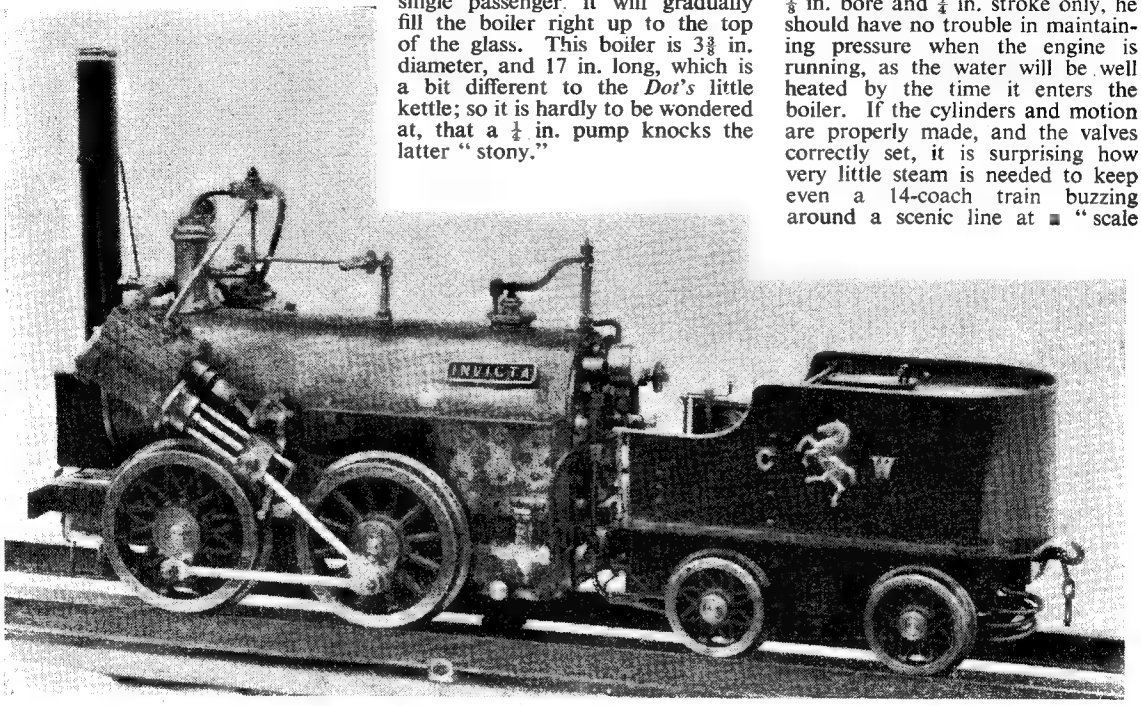
The Big Boiler Fallacy Again

Now about our other friend who has the eccentric-driven pump trouble. As the engine is only required to pull a few coaches on a scenic railway, and doesn't have to haul living loads, an eccentric-driven pump should not be needed. With average workmanship, correctly-fitted pistons and valves, and accurate valve-setting, the *Wee Dot* should pull a 10-coach train for 20 to 30 min. before she needs any more water in the boiler; and personally I'd get tired of seeing it monotonously lapping the track long before that ! Had an eccentric-driven pump been necessary, I should have specified it. As to requiring a bigger boiler, this is an old fallacy bobbing up again. I've said again and again, and it will still bear repeating, that it isn't the *size* of the boiler, but *the amount of heat applied to it*, that makes the steam. In the case of the *Dot*, the firebox space cannot be increased, however big a barrel is fitted; and as a big barrel would need *more* heat to maintain it at the required temperature, our friend would be worse off than ever. It is no "hot air," but a plain statement of fact, to say that I have never designed nor built a boiler that wouldn't steam; and that success is simply due to the *proportions* being right. I got them from the result of actual experience. The inside barrel of the *Dot's* boiler is arranged so that

the burners can keep it at sufficient temperature to supply all the steam needed by the cylinders, under any condition of service.

Too Much Water

The eccentric-driven pump that our other friend fitted, was a commercially-made one with a $\frac{1}{4}$ in. ram. This in itself, is enough to "kill" a normal gauge "1" spirit-fired water-tube boiler. In fact, if the pump had anything like full efficiency, it would simply flood it. However, my experience of commercial pumps is that they are usually far from being 100 per cent efficient; those I examined, in days gone by were certainly nothing to write home about, and I have one or two "horrible examples" here even now, which I keep for curiosities. I carried out plenty of experimenting with feed pumps on old *Ayesha*, and found that a pump just under $\frac{1}{4}$ in. bore and $\frac{5}{16}$ in. stroke, would more than maintain the water level on ■ continuous run, hauling my weight. She isn't the most economical of my engines, by long chalks, being now badly worn; but my idea was, that if a given size of pump would attend to her water consumption, then it would be ample for any engine in better condition. The pump fitted to my $2\frac{1}{2}$ in. gauge L.N.W.R. 4-4-0, which has a very tiny grate, is only $\frac{3}{16}$ in. bore; that fitted to the rebuilt $2\frac{1}{2}$ in. gauge *Cock-o'-the-North*, has a ram made from a bit of 6 mm. rustless steel, and is $\frac{5}{16}$ in. stroke. If used instead of the injector when the engine is on ■ long nonstop run, hauling a single passenger it will gradually fill the boiler right up to the top of the glass. This boiler is $3\frac{3}{8}$ in. diameter, and 17 in. long, which is a bit different to the *Dot's* little kettle; so it is hardly to be wondered at, that a $\frac{1}{4}$ in. pump knocks the latter "stony."



Mr. S. Reeves's "Invicta"

The first gauge "1" locomotive that I described in these notes nearly 30 years ago, was an American-type 4-6-2, and as it was intended for passenger-hauling if required, I gave alternative designs of boilers, both coal-fired locomotive-type, and spirit-fired water-tube type. Both had eccentric-driven pumps; and on the latter, the feedwater was heated before it entered the boiler, by the simple expedient of running the delivery pipe from pump to boiler clack, around the space between the boiler barrel, and the outer casing. This wheeze could be easily adopted by our friend, if he still has a yen for an eccentric-driven pump; and if he throws the commercial one into the scrapbox, and makes another, $\frac{1}{8}$ in. bore and $\frac{1}{4}$ in. stroke only, he should have no trouble in maintaining pressure when the engine is running, as the water will be well heated by the time it enters the boiler. If the cylinders and motion are properly made, and the valves correctly set, it is surprising how very little steam is needed to keep even a 14-coach train buzzing around a scenic line at ■ "scale eighty"; and even the weeny pump specified would probably need the bypass valve opened a little, to prevent the water level rising high enough to cause priming.

I have also had queries about making injectors for boilers of gauge "1" locomotives; but that subject will have to await a future lobby chat.

Scenic Electric Models

Our attention has been drawn by Vitascope Industries Ltd., of Ramsey, I.O.M., to the fact that the Scenic Electric Clock described by Mr. R. N. Gibbs in our issue of June 11th last, employs movements which are covered by British Patents Specification No. 580886, and are owned by the above firm. They hold the sole manufacturing rights for this invention, and anyone copying it, either for the purposes of private use or re-sale, is liable to an action for infringement. We may say that we were not aware of the existence of this patent, and we feel sure that the author of the article worked out the design independently, without prior knowledge of any similar device already in existence.

IN THE WORKSHOP

BY DUPLEX

DRIVING A LATHE GRINDING SPINDLE

THE grinding head described in a previous article has now been in use for some time doing internal grinding work in the lathe.

As the work spindle has to turn at about 30,000 r.p.m. to run a small abrasive pencil at an adequate speed, driving the attachment from the lathe overhead would be a matter of some difficulty. It was decided, therefore, to adopt the usual commercial practice of driving the grinder by means of a small, fast-running, electric motor mounted on a common bedplate. The finished machine, built on these lines, is illustrated in Fig. 1. The motor fitted is a war surplus machine of the type advertised for sale, from time to time, in this journal. These 24 V motors run at some 4,000 r.p.m. and have an intermittent rating of 1/3 h.p. No difficulty was experienced in providing the low-voltage supply, as a suitable a.c. transformer, having a wide range of tappings, is in everyday use in the workshop. Although these 24 V and 32 V motors, and other appliances, are most expensively made to a high standard of accuracy for use by the Services, they can, nevertheless, usually be bought quite cheaply, often in new, unused condition.

The limitation imposed by the intermittent rating is of little consequence in the present instance as, when grinding, the motor can be stopped between cuts while resetting the feed, and overheating, it is found, does not then take place.

The Driving Belt

It is advisable to fit a cotton driving belt of the kind specially made for this work; for, at the high surface speed required, the centrifugal force is considerable and will cause slip, unless the belt is of very light weight.

Suitable endless belts of various standard lengths can be obtained from Messrs. Buck and Ryan; the one fitted to the machine is $\frac{5}{8}$ in. in width and 3/32 in. thick.

Construction

The baseplate *A* is made from a length of $\frac{1}{2}$ in. mild-steel plate, and it must be scraped true and flat

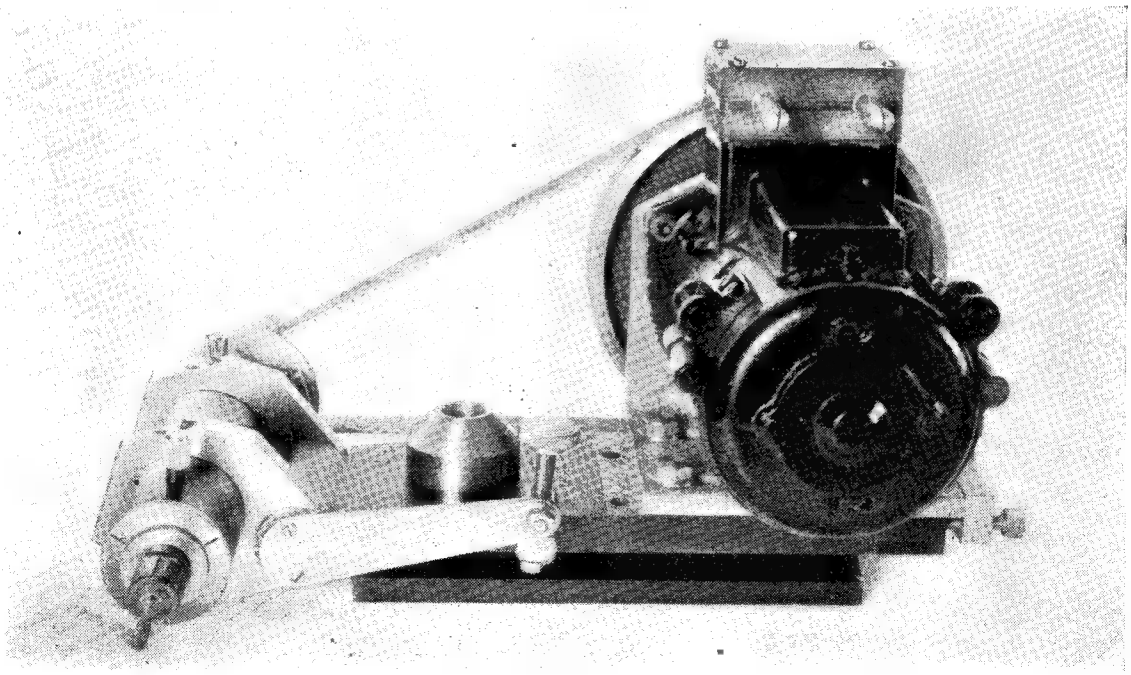


Fig. 1. The finished grinding attachment

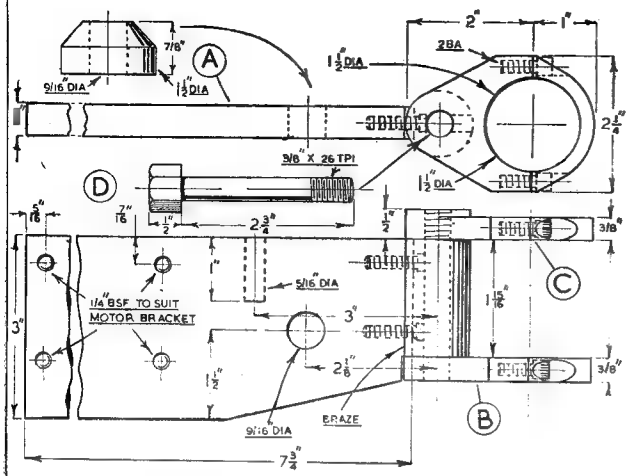


Fig. 2. A the baseplate; B and C the two grinder housings; D the cross-bolt

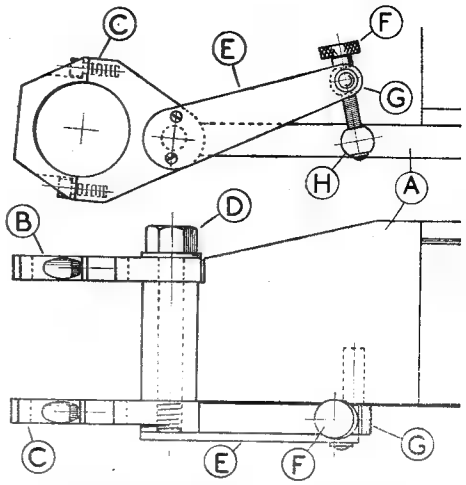


Fig. 3. The centring mechanism. E the control arm; F the adjusting-screw; G the threaded trunnion; H the pivoted trunnion

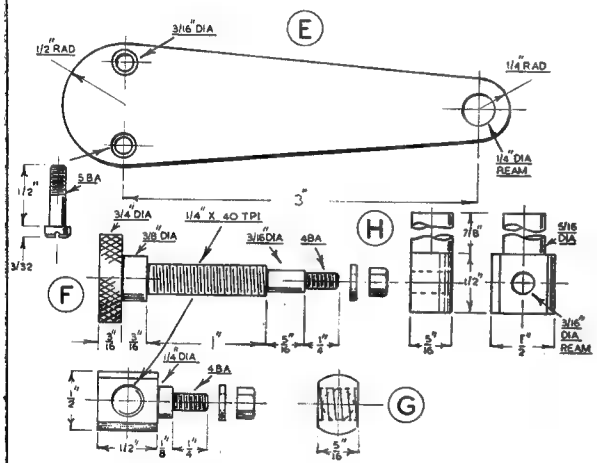


Fig. 4. Details of the parts comprising the centring mechanism

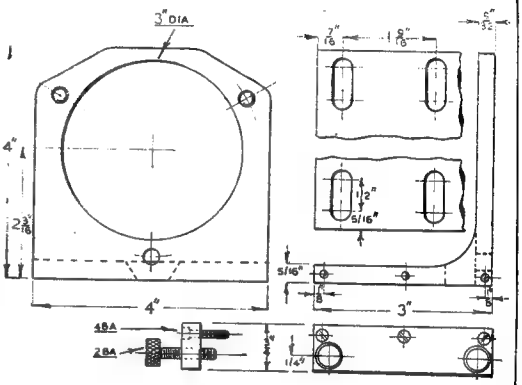
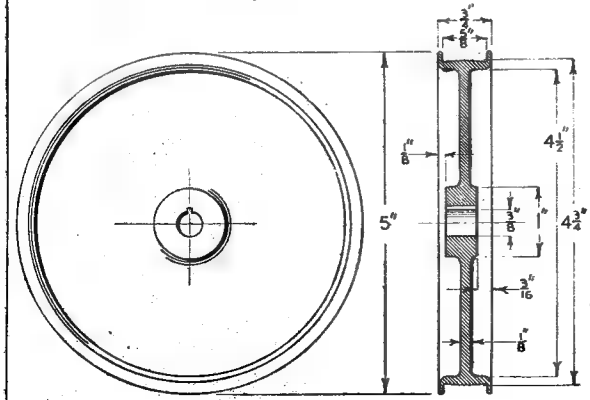


Fig. 5. The motor angle bracket and, below, the belt-tensioning bar



Left—Fig. 6. The motor belt pulley

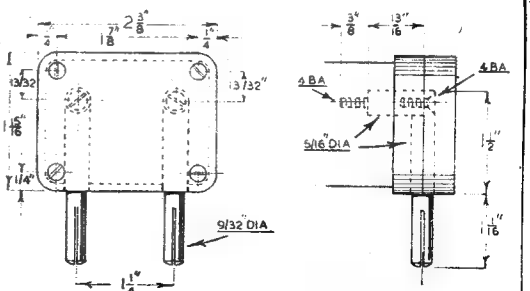


Fig. 7. The plug connector secured to the motor terminals

on its under surface to provide an even bearing for bolting to the lathe topslide. At the same time, it is advisable to examine the work face of the topslide and, where needed, to scrape down any irregularities caused by bolting down the lathe tools.

Before making and drilling the baseplate, the dimensions of the motor must be taken into account, so that the shaft centres can be correctly set out to accommodate a belt of some standard length. As will be seen in the drawing, a length of 1 in. diameter round rod is attached to the right-hand end of the baseplate to carry the cross-bolt *D*, securing the grinder housings in place. For this purpose, the bored and faced rod is slotted axially from end to end to fit closely on to the baseplate; following this, the rod is secured with two sunk screws and the joint is finally brazed.

Another method is to pin the rod in place and braze the joint; the bolt hole is then drilled with the baseplate bolted to an angle plate standing on the drilling machine table, and the ends are faced square either with a spot facing cutter or by a milling operation in the lathe.

Exactly Parallel

Whatever method is adopted, the important thing is that the axis of the bolt hole should be exactly parallel with the under surface of the baseplate, and the ends of the rod square with the hole axis; otherwise, the grinding spindle will be out of parallel with the lathe axis. The baseplate is finally drilled for the passage of the toolpost stud, and a collar is fitted to the stud in order to reduce the length of thread projecting.

The Grinder Housings B and C

Here again, the true alignment of the grinding spindle in relation to the lathe axis will depend, in part, on the accuracy of the two housings.

Except for drilling the holes for the cross-bolt, the housings can be machined separately by first fitting the two bearing caps, with accurately machined abutment faces, and then forming the bores to a pinch-fit on the body of the grinding head.

The two housings, together, are then secured to a $1\frac{1}{2}$ in. diameter stub, and the holes for the cross-bolt are drilled to tapping-size through both components. The housing *B* is afterwards opened out to the clearing size, and the other *C* with the integrally formed boss, is tapped $\frac{3}{8}$ in. × 26 t.p.i.

The grinding spindle can now be mounted in its housings, and the assembly secured to the baseplate for checking the alignment of the parts. The baseplate is placed on parallels resting on the surface-plate, and the test indicator is applied to either end of the grinder body in turn. If the work has been accurately carried out, the test indicator will show that the grinding spindle lies parallel with the under surface of the baseplate, and the machine will, therefore, be correctly aligned when mounted on the lathe topslide.

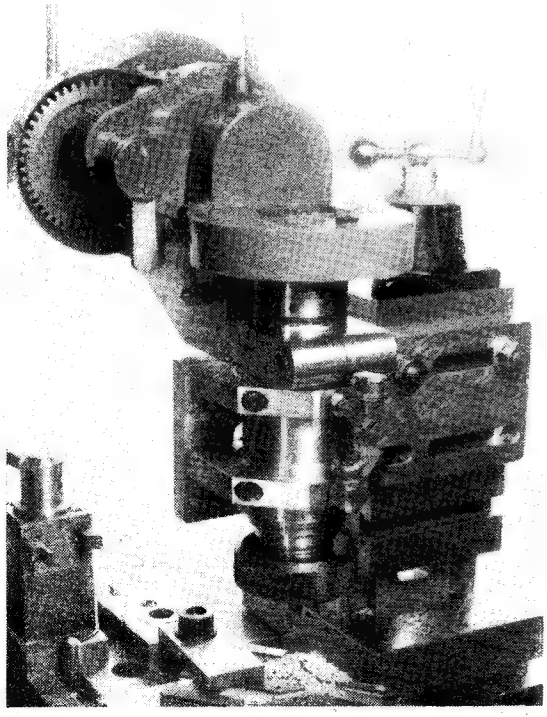
The Centring Mechanism

To provide a range of adjustment for setting the grinding spindle at exactly lathe centre height, the grinder housings pivot on the cross-bolts *D*, under the control of a rocking mechanism. As shown in Fig. 3, the arm *E* is secured to the boss of the housing *C* with two 5-B.A. screws, and at its other end the arm is controlled by the screw trunnion *G* and is located in the lower trunnion *H*, which is pivoted in the baseplate.

In this way, the grinding spindle is given a rise and fall movement, amounting to a full $\frac{1}{4}$ in. either way, but the grinding head is firmly secured by tightening the cross-bolt.

The Motor Mounting

Some of the surplus motors on



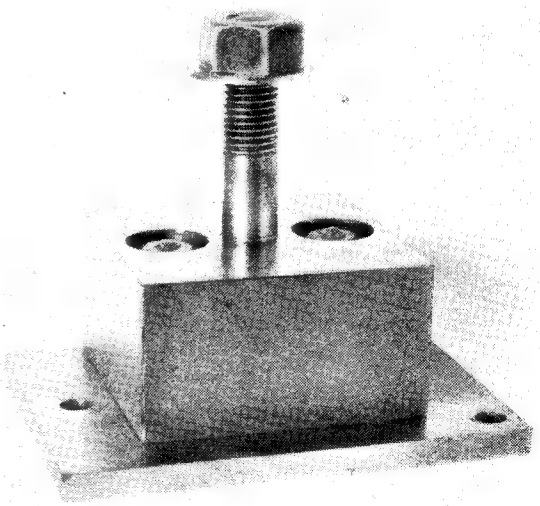


Fig. 11. *A rigid form of cross-slide mounting for the grinding attachment*

Left—Fig. 10. *Milling the connector parts in the lathe to form the wiring slots*

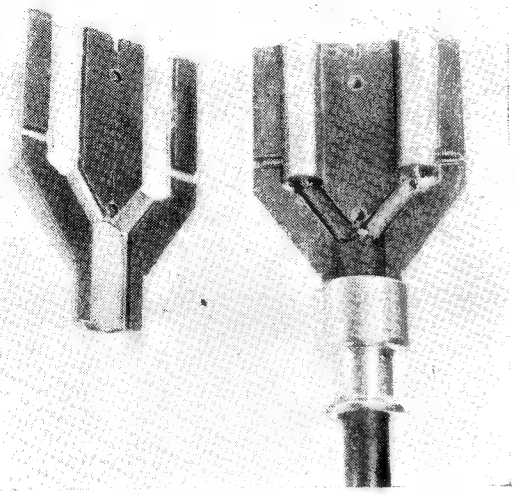


Fig. 8. The two halves of the connector socket

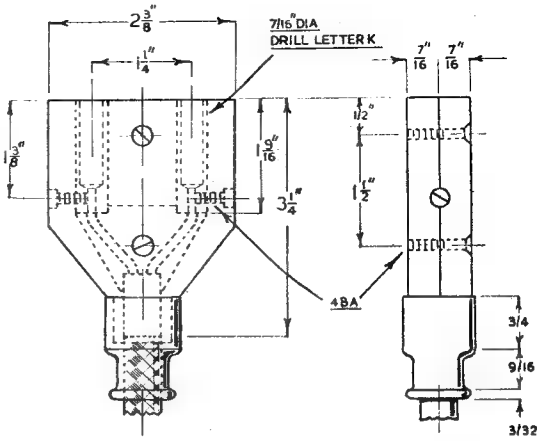


Fig. 9. The socket portion of the cable connector

the market are of the flange-mounting type, and one of this kind was secured to the baseplate of the grinder by means of an angle-bracket.

One advantage of the flange-mounting is that a narrower baseplate can be used, as the bracket is secured towards the driving end of the motor. The bracket illustrated was made from a short length of large angle-iron and, to obtain flat bolting faces, the material was mounted on an angle-plate, attached to the lathe faceplate, for machining the two outside surfaces.

Although the base of the angle-bracket is slotted, it is advisable to provide alternative bolting holes in the baseplate, as the cotton belts, previously mentioned, are liable to stretch more than might be expected. As shown in the drawing, ■ screw adjustment is fitted for tensioning the belt and aligning the motor. This consists of ■ bar attached to the angle-bracket, and the points of the two knurl-headed screws fitted to the bar bear against the end of the baseplate.

The Motor Pulley

The diameter of the driving pulley will, of course, depend on the rated speed of the motor, and should be large enough to rotate the grinding spindle at ■ speed suitable for the abrasive wheel fitted. However, the speed may be reduced for internal grinding, and satisfactory work can be done with the wheel operating at ■ surface speed of 2,000 ft. per minute.

For the pulley illustrated, a cut-off from a 5 in. diameter mild-steel bar was machined to the finished shape, but an aluminium casting or ■ soft-alloy pulley could be used if in proper running balance. Pulley flanges will be found necessary when running flexible cotton belts at very high speeds.

The pulley was keyed to the motor shaft and secured in place with a lock-nut.

The Wiring Connections

As the motor, when under load, takes some 20 amp on the 24 V tapping of the transformer, it is essential to provide robust wiring connections, both to guard against a voltage drop and to prevent overheating of the wiring.

The plug connector illustrated was, therefore, specially made for connecting the cable from the transformer.

The two pins of the male portion of the fitting are connected directly to the motor terminals by filing the ends of the pins down to the diameter 'line, and then securing them to the terminals with 4-B.A. screws. The bodies of both parts of the connector were machined from laminated Tufnol, but any plastic insulating material will serve for the purpose. The female portion, or socket, is similar to the standard type of fitting; but, in addition, ■ duralumin cap is used to support the cable and give a more finished appearance. As shown in Fig. 10, the plastic material was machined with the aid of the milling attachment recently described in this journal. The work was clamped to the cross-slide and, with the attachment bolted to the lathe bed, the grooves for the wiring were cut to the half-depth in either component with ■ round-nosed end-mill. There is no need to buy special end-mills for this work, for satisfactory cutters can easily be made in the workshop; these are like the old-fashioned spade-drill, except that the two cutting edges are made curved instead of being filed straight. For machining metal, cutters must, of course, be hardened and tempered, but some plastics are readily machined with unhardened tools; in fact, a number of parts were successfully turned and threaded recently from Perspex, using mild-steel form-tools filed to shape. Moreover, these tools kept their edge well and still seemed quite sharp after considerable use.

Switch Control

As the current carried by the low-voltage wiring is so heavy, it is best not to incorporate ■ switch in this circuit; instead, an ordinary 5-amp switch is fitted near at hand for controlling the mains input to the transformer.

An Alternative Mounting

Instead of mounting the grinding attachment on the lathe topslide, it can be secured directly to the cross-slide on ■ base-fitting of rigid construction. For this purpose, ■ pillar mounting, with single clamp-bolt and footing of small diameter, is best avoided as lacking in rigidity.

On the other hand, the mounting illustrated in Fig. 11 is preferable, both on the score of greater rigidity and because the strain on the saddle T-slots is then more widely distributed.

Talking about Steam—

NO. 20. SHOWMAN'S FITTINGS FOR THE FOWLER "BIG LION"

By W. J. HUGHES

AS mentioned in the last article of this series, I was prevented by circumstances from finishing drawing No. T.E. 5(B), reproduced herewith, in time, and thus its announcement in the article before that was premature. My apologies to those brothers who were inconvenienced thereby! However, here it is, together with a few more photographs of Fowler showmen's engines. The print itself, by the by, is to 1-in. scale, not 1½ in.; the latter would have made a very large unwieldy sheet, whereas the former can easily be "translated" to the larger size if necessary.

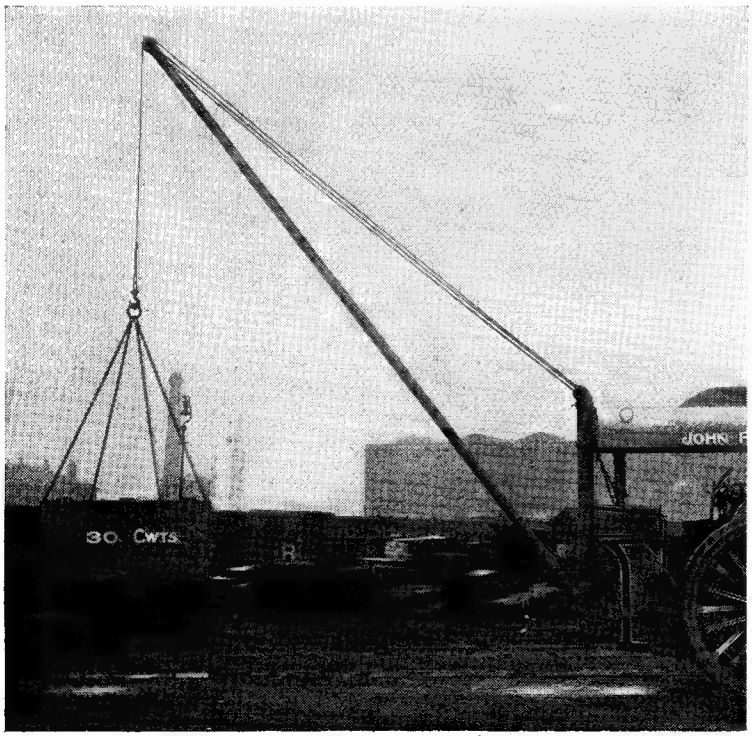
Many readers will know the dodge of having a rule marked off in *twelfths* of-an-inch, which, of course, will correspond to inches on the prototype. All one needs to do, then, is to measure in twelfths on the 1-in. scale drawing, but call them eighths for 1½-in. scale, which also corresponds to inches on the prototype. For example, 7/12ths in 1-in. scale equals 7/8ths in 1½-in. scale, and both equal 7 in. in full size.

Early Crane Fittings

One difficulty about building a model to incorporate crane fittings is that, so far as I am aware, there are no drawings available of the earlier type of crane fitted to Fowler engines. As with the canopy and other fittings, therefore, I have had to adapt a later crane to fit the older locomotive.

The early crane is shown in the first photograph, which (like the other photographs herewith) is an "official" photograph reproduced by permission of Messrs. John Fowler & Co. (Leeds) Ltd. This locomotive, No. 15658, was built for Simon and Tengo in 1923, and later became F. Harniess' *His Lordship*. She was not actually a "Big Lion," but a 7 n.h.p. (Class R3), and was the only Fowler built with an extended smokebox to carry the separate exciter behind the chimney. Mr. Stephen Mustill, to whom I am indebted for much of this information, said that when he last heard of her she was in the threshing business near Pontefract, Yorkshire.

Incidentally, she has the later type of tender, in which it is the curved backplate and the tank-bottom which are flanged, the side-plates being flat. In the prototype shown in my drawing (T.E.5), the side-plates are flanged, and the back and the tank-bottom riveted on. The crane turret or support is tubular, and bolted by clips to the back of the tender and the top of the canopy. It is supported at the foot on a plate fastened to the drawbar. The turret is stayed to the rear wheel rims, when the crane is in use, by means of chains. Twin flexible ropes support the outer end of the jib at a constant radius, and the hoisting-rope passes over the pulley at the top of the turret, down the turret, and round a pulley near its foot to the fairlead, through which it passes to the winding-drum on the hind axle.



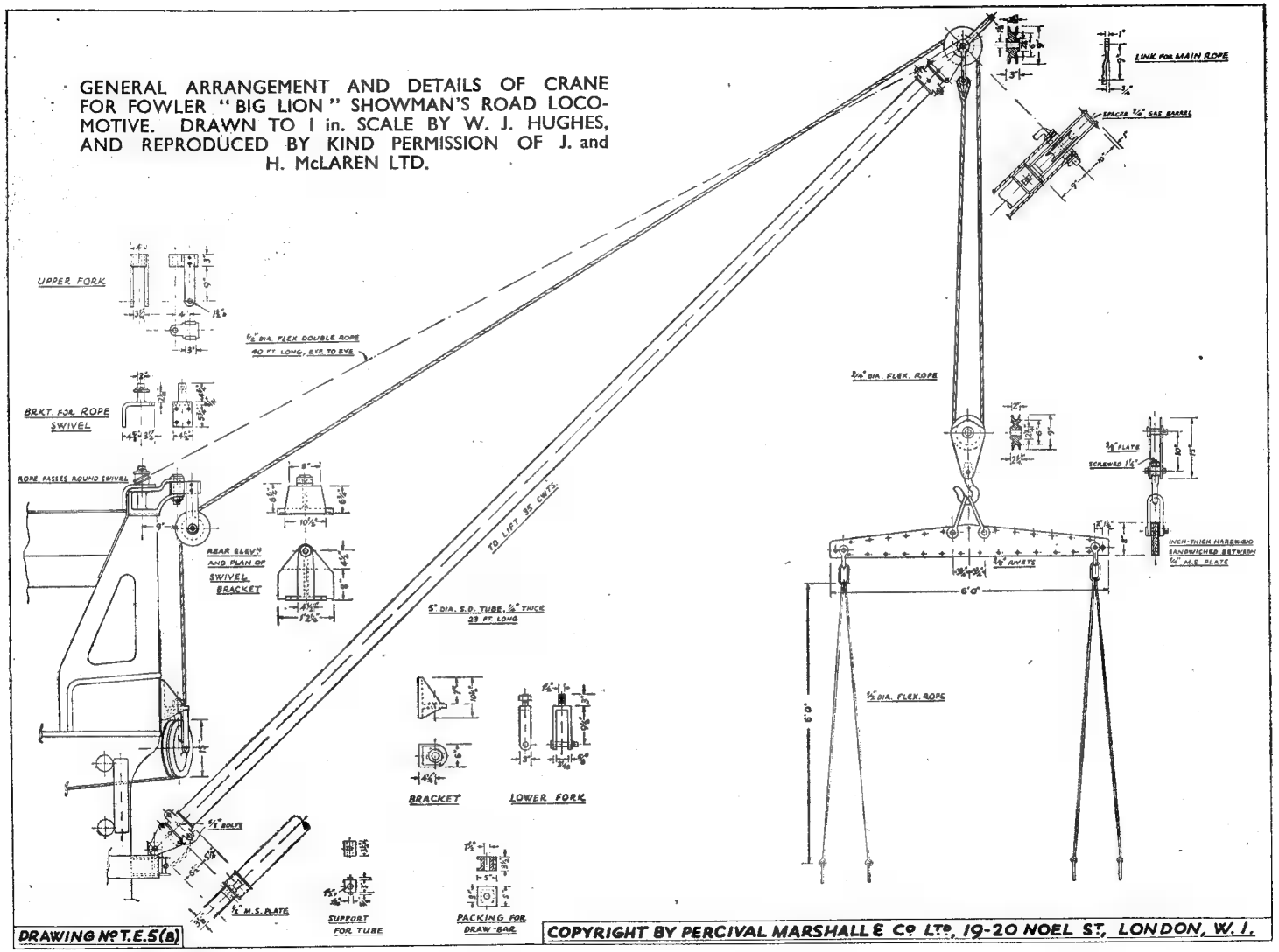
Early type of crane as fitted to the "Big Lion." Note anchor-chains (not tightened) to hind wheel rims.

The larger photograph of the locomotive is included because it shows more detail of the engine itself, which will probably be useful to a model-builder. It will be seen that there is no foot-board fitted, and that the hose-bracket is riveted to the belly-tank. Note, too the twisted brass decoration to the steering shaft, and that the rubbing-plates for the front wheels have to be bolted to the smokebox instead of being riveted to the boiler shell.

Later Fittings

The later crane fittings included a turret built in to the engine itself, as described in the preceding article. It is crowned with a steel casting, in which swivels a fork holding the upper pulley. The base of the casting is bolted to the turret top, and its front to an extension-plate

GENERAL ARRANGEMENT AND DETAILS OF CRANE FOR FOWLER "BIG LION" SHOWMAN'S ROAD LOCOMOTIVE. DRAWN TO 1 in. SCALE BY W. J. HUGHES, AND REPRODUCED BY KIND PERMISSION OF J. and H. McLAREN LTD.



DRAWING Nº T.E.5(8)

FULL SIZE, TO 1 in. SCALE, WORKING DRAWINGS ARE OBTAINABLE FROM YOUR LOCAL DEALER, OR BY POST FROM THE "MODEL ENGINEER" PLANS DEPARTMENT 19-20, NOEL STREET, LONDON, W.1, 3s., POST FREE.

riveted to the front of the turret (drawing T.E.5 [A]).

To the front and top of the casting is bolted the angle-bracket which carries a vertical pin on which the rope-swivel is mounted. This swivel or guide has a groove, at an angle, round which passes the 40 ft. long rope which supports the outer end of the jib at a constant radius. The eyes at the outer ends of this rope fit over the pin on which the outer pulley revolves.

In the official drawings, dated 1932, from which mine were adapted, and as shown on the photograph of *Onward*, herewith, a special horizontal pulley was mounted over the fairlead. The winding-rope passed from the drum round this pulley, then round that held in the lower fork, and so on. However, with the larger fairlead fitted to the early engines, this special pulley would not be needed, and thus it is not shown on drawing T.E.5 (B).

The lower guide-pulley, 15 in. in diameter, is carried in a fork bolted to the steel bracket mounted on the back of the tender. Note that a rectangular recess is cast in the under-surface of this bracket, so that the fork cannot swivel once the screw has drawn it up into place.

The Jib

The jib proper is a 23 ft. length of solid-drawn steel tube, 5 in. in diameter and ¼ in. thick in the wall, its ends fitting into sockets bored in two identical castings, with a ⅝-in. bolt passed through both to secure them. To the castings are bolted, also with ⅝ in. bolts, pieces of ½ in. thick steel plate, to form the bottom bearers for the jib, and the bearers for the crane-pulley, respectively. Note that the upper bearers are extended outwards, with a spacing-piece of ¾ in. diameter gas-barrel between them.

The support-block at the lower end of the jib rests on top of the draw-bar, between the jaws of which is placed the packing-piece shown. At its upper end, the pin on which the pulley rotates carries two links. These are each set in ¾ in., and the eye at the end of the winding-rope fits between them, with a pin through all.

Steel-plate ⅜ in. thick is used to form the lower pulley sheave; the forged crane-hook can be rotated in its eye. Slung from the hook is a spreader bar, laminated from inch-thick hardwood with ¼-in. plate sides, with ⅜ in. diameter rivets through all. From the ends of the bar are hung the ½ in. diameter flexible rope slings, used in lifting the scenic cars.

Well-designed

Here, then is a layout which is well-designed for the purpose, being efficient and well up to the job it has to do. One feature of the design which may be noticed is that most of the parts, which are liable to wear and tear or accidental breakage, could be replaced easily at a local workshop—even at the village blacksmith's—without having to send to Leeds for replacements.

Another point, very important to the showman, is that the whole thing could be dismantled easily and quickly after use, and built up again just as easily at the next pitch. The travelling showman never had any time to waste when setting up his rides !

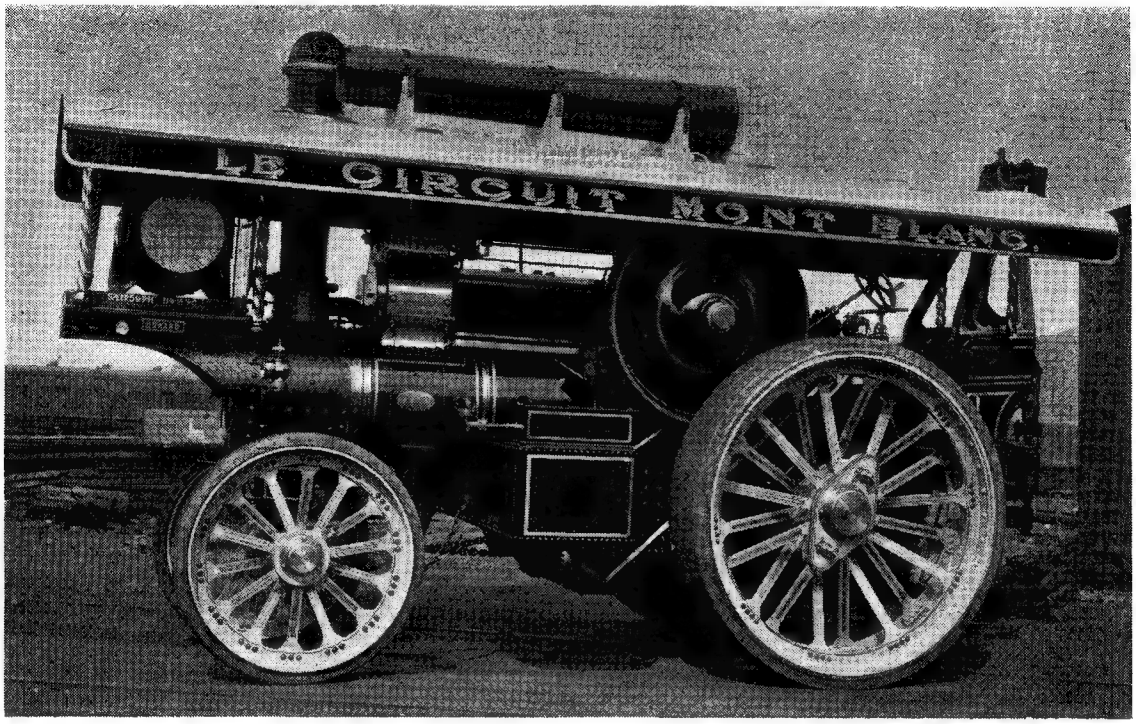
Finish

For the present, at least, this article concludes the series on the Fowler "Big Lion," but I am pleased to know, from letters I have received, that the information given has been widely appreciated, not only by builders and would-be builders of the Fowler, but also by other road-locomotive builders, including several in the "free-lance" class. Many of those who have written have mentioned especially their gratitude to Stan. Green, of Canada, whose drawings have been of such value, and I heartily endorse these sentiments.

Several correspondents have asked when complete "detail" drawings will be ready, but, as has been said already, this is much too much of a task for me to undertake for some time yet.

One or two other readers have asked why I have only published photographs of the very latest Fowler

Fowler No. 15658 "*His Lordship*," *the only one of this make fitted with separate exciter*



Fowler No. 19989 "*Onward,*" *which, though not quite so ornate as* "*Supreme,*" *was a lovely example of her class*

Showman's engines, instead of earlier ones. The answer to that is simply that these are the only ones in my albums which are really *fit for reproduction*, which is very important, and which I have permission to print. Many readers are kind enough to send me photographs, and I am always very pleased to have them; but, unfortunately, almost invariably these are not clear enough to print. Inevitably even the best of photographs lose much detail in the block-making and printing, due to the mechanical processes involved, and what may appear to be a fairly good original would frequently be a sad disappointment when reproduced.

Finally, just a simple plea to anyone building a showman's engine of any type! *Please* see that the lettering on the side-boards of the canopy looks right, because so many fine models have been spoiled by the lettering. It's easy to make an excuse, and, of course, lettering is not easy to do, for most people. But it is well worth while putting in some practice—perhaps with water-colours or poster colours on paper—before tackling the actual job. Then with fine brushes, decent quality paint, and patience, it should be possible to make as good a job of the "sign-writing" as of the machining and fitting!

Official Photographs Available

I have already expressed my thanks to Messrs. John Fowler and Co. (Leeds) Ltd., for permission to use certain official photographs in these articles, and I am sure that readers will readily endorse this. In recent correspondence I was informed by Messrs. Fowler that sets of these photographs (and I believe others, too) may be purchased on application to Mr. A. Pepper, Chairman, Fowler Veterans Association, Fowler Works, Leeds, 10.

Please note, however, that all enquiries should be addressed to Mr. Pepper, and *not* to me, and may I recommend that they should be accompanied by a stamped addressed envelope.

TWIN SISTERS

by J. I. AUSTEN-WALTON

THE smokebox for this locomotive is shown on the accompanying drawing. It is exactly like the prototype in that there is no separate smokebox saddle. On most miniature locomotives, the saddle is an advantage enabling the steam connections to be made up and to project above the saddle portion, so that the smokebox itself forms the final air-tight seal. This locomotive, following full-size practice with its steam and exhaust pipes finishing high up with an inverted "Vee" form, make the one piece practical and convenient.

Some time ago, I was fortunate in getting hold of some seamless-steel tube of the exact size required with an ample machining allowance inside and out. It was all cut up and roughly faced to length, after which it was put away under the work bench until required.

As time went on, and various "Twin Sister" builders came to visit me, each visitor departed with one of the tube lengths as a sort of "help along" token of his visit, and so the stock vanished—except just the one length I needed for my own job.

There is no reason why you should not scrounge about yourselves for some suitable tubing, but in case your searches prove fruitless, an equally sound smokebox may be built up from plate, rolled in the same way as a boiler section. I then suggest that you have the joint welded, or at least hard brazed, after which it should be machined inside and out in order to secure a truly round and even part. In point of fact, the inside machining may be confined to the first half-inch or so, for it is only for a short distance inside each end that the machined smokebox rings have to fit. Both fits should be reasonably airtight, hence the need for machining at all. The rings that go in, proved to be too much for the present drawing, so these will appear on the next sheet, together with full details of the dome (outer), and the safety-valve base cover. The door and hinges will also figure in this.

Smokebox Base

This, you will observe, is a fabricated part, with which there should not be much trouble. When I did the job, I gave myself a lot of unnecessary work by leaving the drilling and fitting of the fully-detailed rivet system until after the lower smokebox system had been brazed to the smokebox barrel. I then found that it was almost impossible to rivet over the dummy rivets on the inside, and had to make up a sort of punch affair in order to reach them. You may avoid all this by putting the rivets in first, leaving only those that come near the point of brazing, or go right through to the inside of the barrel, where they may be got at quite easily. Not all the rivets are "fancy." The inner vertical row on each side will serve to fasten the parts together, after the outer rows have been finished "dummy" inside and filed flush to give a clean flat surface.

Once the parts are together for the lower section, the sweep that takes the barrel portion may be filed to make a good fit with it, filing the side sections to a thin edge that will mate closely with the barrel sides, so that, after brazing or sif-bronzing (the latter being particularly recommended) the filing away to a flush radius should be quite easily achieved. This joint will do much to make or marr the whole look of the finished job, and I suggest that the brazing material be put on liberally, so that you may obtain a good sweeping radius, simulating the one-piece effect we want to achieve.

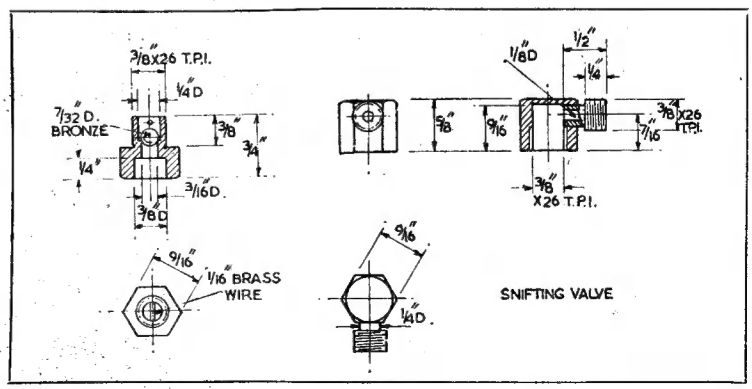
The other brazing is round the front edge, where the fillet would be best if left small, whilst the back edge may be either brazed and filed quite flush, or left out altogether. There is no call for air-tightness anywhere outside the confines of the barrel section, and the brazing of the other three sides will give more than enough mechanical strength.

Make up, but do *not* fit the front and back shelf parts. When the smokebox is fitted, complete with the rings, and the boiler itself is in place, the final level and trim will be settled and maintained by the two shelves or "aprons." One of these shelves, rests on the front bufferbeam edge, where it may further be secured by drilling and fitting two 8-B.A. set-bolts to engage with the brass angle fixed inside the bufferbeam. The second shelf is supposed to rest on the top edge of the No. 2 stretcher, and between the two, the lower part of the smokebox will be suspended, not requiring to rest on anything itself.

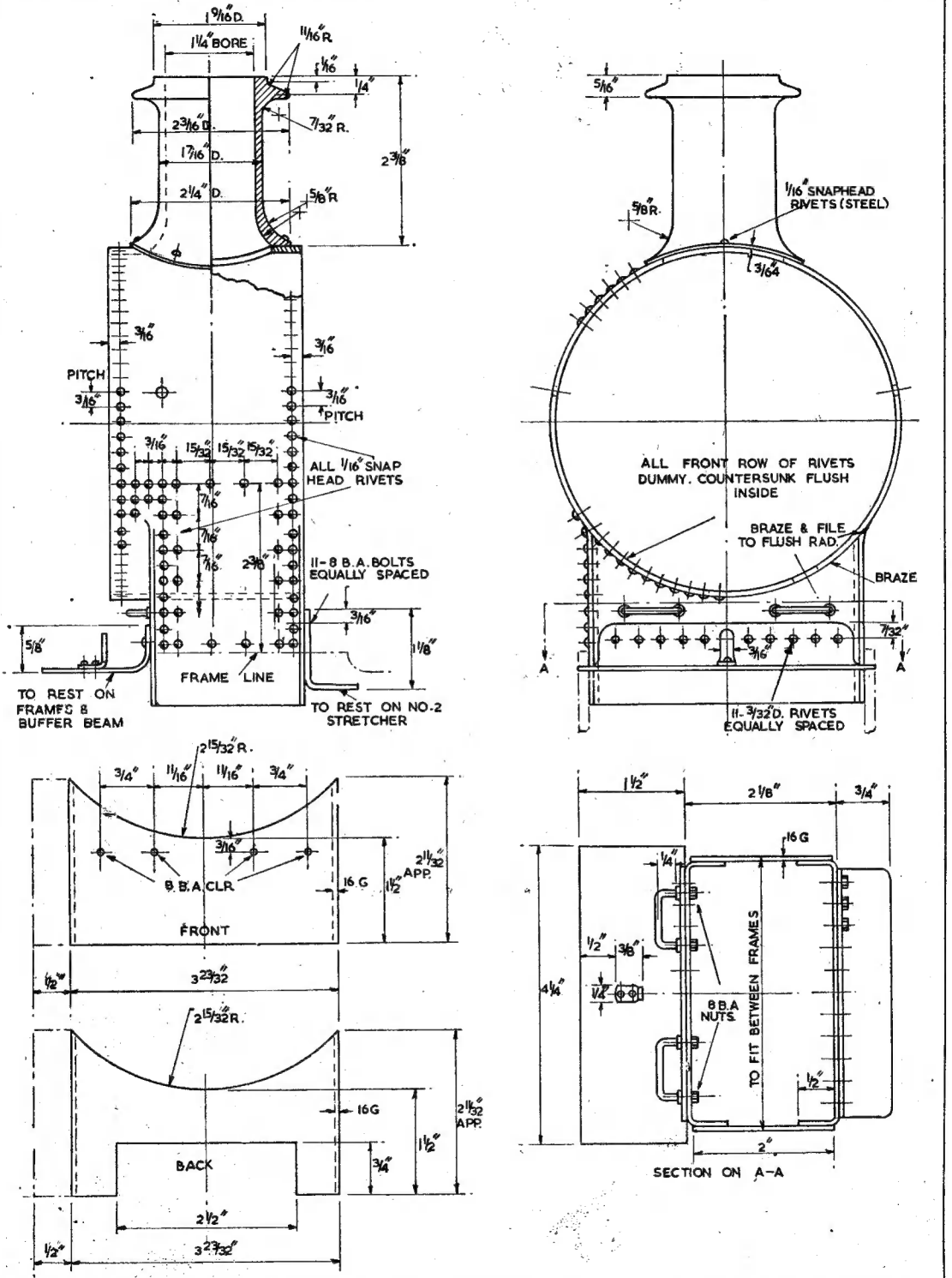
You may wonder why the rear shelf has its centre portion cut away. On my own job, I found the steam-pipe flanges just fouled the back of the smokebox at this part, the interference being a little under $\frac{1}{16}$ in. There is, on the prototype, a similar shelf or apron plate, but not fitted for the reason given. In this case it is part of the necessary construction of the whole smokebox.

Smokebox Barrel

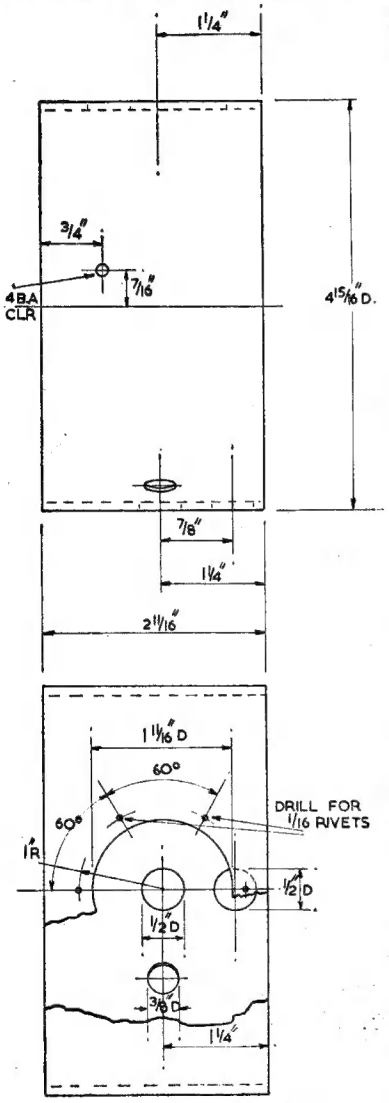
Once the smokebox barrel has been cut, rolled, brazed or otherwise fabricated, the remaining work is that of drilling various sizes of holes, and setting a large number of rivets.



Continued from page 746, *Vol.* 108, *June* 18, 1953.


9/16" D.
1 1/4" BORE
11/16" R.
1/16"
1/4"
7/32" R.
2 3/16" D.
1 7/16" D.
2 1/4" D.
5/8" R
2 3/8"
3/16"
PITCH
3/16"
3/16"
PITCH
3/16"
15/32"
15/32"
15/32"
ALL 1/16" SNAP HEAD RIVETS
7/16"
7/16"
7/16"
2 3/8"
11-8 B.A. BOLTS EQUALLY SPACED
3/16"
1 1/8"
5/8"
FRAME LINE
TO REST ON FRAMES & BUFFER BEAM
TO REST ON NO.2 STRETCHER
5/16"
1/16" SNAPHEAD RIVETS (STEEL)
5/8" R.
3/64"
ALL FRONT ROW OF RIVETS DUMMY. COUNTERSUNK FLUSH INSIDE
BRAZE & FILE TO FLUSH RAD.
BRAZE
7/32"
3/16"
A
A
11-3/32" D. RIVETS EQUALLY SPACED
2 15/32" R.
3/4"
1 1/16"
1 1/16"
3/4"
3/16"
8 B.A. CLR
16 G
1 1/2"
2 11/32" APP.
FRONT
1/2"
3 23/32"
2 15/32" R.
16 G
2 11/32" APP.
1 1/2"
BACK
3/4"
2 1/2"
1/2"
3 23/32"
1 1/2"
2 1/8"
3/4"
16 G
1/4"
1/2"
3/8"
1/2"
4 1/4"
8 B.A NUTS
TO FIT BETWEEN FRAMES
1/2"
2"
SECTION ON A-A

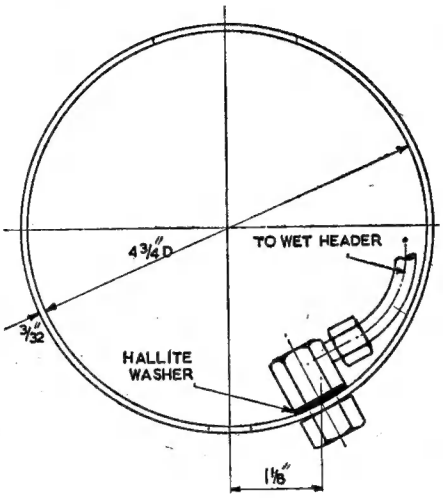
Taking the big holes first, the largest of these is the top aperture for the chimney. You may produce this as you will, but it must be borne in mind that the corresponding exhaust hole, drilled ½ in. diameter, in the bottom, *must be exactly* opposite the chimney aperture above it, in both planes. There being no petticoat pipe to worry about, you will



have a little latitude or opportunity to cheat with the positioning of the chimney itself; but this cannot be overdone, otherwise you will present a ridge of metal on one side or the other, to interfere with the blast. It does not require very much in the way of local interference to upset the smokebox vacuum essential to good steaming.

The other ½-in. hole should be made to the dimension given, and tried over the existing pair of pipes made; the fit should be an easy one, otherwise you may experience difficulty when removing the complete boiler when it comes to "shopping time."

The remaining big hole, ⅜ in. diameter, is for the snifting or anti-vacuum valve. The valve itself and the pipe serving it are of the pure



functional variety. I believe in making the free air entry really live up to its name, and when coasting with the steam shut off, the difference this extra air supply can make, is almost unbelievable. In any case, the fitment is not seen from the outside, and no appearances are spoiled. The pipe shown is the one left as six inches spare from the header, and which appeared on another drawing. The actual cutting to length, and the fitting of the union-nut to suit, is left until the boiler is fitted to the completed smokebox, so this item need not worry us at the moment.

You will notice that the entire front row of rivets round the barrel part of the smokebox is shown as "dummy" and flush-riveted over inside. This is my normal practice with smokebox fronts, and enables the user to withdraw the entire front ring and door in one piece. Jobs like sweeping flues, doing up union-nuts and sweeping out the ashes after running are easy, compared with peering about with a torch and scraping about with little bits of tin to remove the last traces of ash deposit. But please yourselves; you may rivet the ring in place permanently if you wish, but do not blame me if you come across inaccessibility troubles. The back ring is a different matter; here we require a permanent fitting. I do not necessarily suggest making *every* rivet shown, a working rivet. About every fourth rivet should be taken right through, leaving the others flush-finished over as for the front row.

The Chimney

The chimney is available in casting form, and friend Kennion should have plenty in stock. This is another one of the parts that may either make or mar a locomotive; more often, it is the latter, but there is no reason why it should be. The full and complete dimensions are given, and I seriously suggest that you draw this profile, truly to scale, on a piece of thin sheet metal, and then cut it out and file it carefully to the scribed line. This should then be used as a turning template, offering it up frequently between cuts to make sure the finished shape conforms *exactly*. Some folk have "an eye" for a chimney, and may produce a decent looking job without any of these precautions being necessary. All I can do is to give the shape, as lifted directly from the works drawings.

The best way to machine the chimney is to chuck it firmly by the top rim, and then bore out the inside, taking only light cuts. Then turn up a mandrel to fit the bore snugly, and continue with the outside, using the check template as suggested. You will not be able to turn beyond the highest part of the skirt radius, but I do suggest you continue as far as this, running the cut right out to the skirt edge. This operation does admittedly require a considerable degree of skill, due to the disconcerting effect of the interrupted cut occurring twice per revolution. The speed of the lathe should be reduced to about 200 r.p.m. or thereabouts, and a very broad-radius tool set up and used in conjunction with some careful juggling with the top-slide and cross-slide handles. This is not a job to be rushed off in a couple of minutes. The skirt edge may be turned off to clean it up all round. In spite of its wiggle-woggle progress round and round, it is a straight slide-rest progress until every part is reached, and should not give trouble.

The base portion, where it mates

with the smokebox top, may be dealt with " de-luxe " by holding it, still on its mandrel, and machining with a fly-cutter in the milling machine or a special set-up on the lathe; the cutter is, of course, set to exactly the same radius as the smokebox which, you will observe, is a fairly wide sweep. I suggest you make a few careful calculations before spending time on a rig that will come beyond the scope of your lathe. Failing the machining method, you will have to fall back on the good old faithful half-round file, but you will still be able to get a snug fitting by wrapping a piece of coarse emery paper round the smokebox itself, and " lapping " the chimney base to it by hand.

A Filing Method

Completing the top sweep round the base top is one for which I know no machining method, and I think I am safe in saying, that there just *isn't* one. If you have carried out the other suggestions made, you will at least have part of the desired base radius to guide you. Hold the chimney at a convenient angle in the vice, working round carefully with a large, coarse half-round file, and occasionally remove the part, and hold it up to the light to check the profile from every angle. The holding should be by the mandrel, left in until the job is completed, after which it may be knocked out carefully. Most chimneys have a slight rim, not rounded off, but left square and well defined, as shown on the drawing.

Domes are, as a rule, just the opposite, and one usually finds the base taken right away to almost a knife-edge, but more of that later, when we come to it.

When the chimney is finished and the fixing rivet holes are drilled, I suggest you leave the actual fixing until the boiler is in place and the blast pipe fitting set up. Only then will you be able to line up the chimney with the actual blast pipe orifice—the most essential thing to observe.

Further Hints

I forgot to mention the inside flare or radius inside the chimney. This really wants to be long and sweeping, with its largest diameter matching the hole in the smokebox barrel. It is, in a way, better to have this flare smaller at the base than the hole over which it sits. This permits of a certain amount of adjustment of the chimney for true vertical position when finally setting it up, at the same time avoiding any chance of the hole edge interrupting the easy flow of the exhaust steam and gasses. This slight reduction will not in any way affect the performance of the locomotive, and ample provisions have been made for chimney area.

And now, going back to the smokebox base, here is a simple tip for clamping the barrel portion to the rectangular base during the brazing operation. Pass a long bolt through one of the ½ in. holes, and through a piece of bar steel, drilled with a suitable hole in its middle, to act as a clamping bar across the bottom opening. This will hold the job very firmly, and will not get in the way during the brazing operation.

The finish, for those who prefer to paint as they go along, is a dull black for the whole unit (inside as well), and the two front handles left bright. I suggest stainless-steel wire for these.

Final Warning

When making up the base of the smokebox, make sure it will fit in between the frames before brazing the whole lot up solid.

(To be continued)

THE "RAWLPLUG" DRILL HAMMER

We have recently been given facilities for testing out this appliance, which has been introduced by the makers of Rawlplugs to improve on the methods hitherto available for drilling masonry or concrete. It is designed to be capable of attachment to an electric drill or large hand-brace, having a ¼ in. diameter shank which can be held in the drill chuck, and at the other end a holder for the wall drill, which is similar to the normal Rawlplug tool, specially adapted to fit the holder. The body of the appliance contains a rotary hammer mechanism which strikes a blow on the drill holder at each revolution of the input shaft. By means of an adjusting collar, the force of the hammer blows can be regulated to light, medium or heavy, and an automatic safety clutch is incorporated to prevent overload.

To keep the drill clear of dust and chips, the body can be rotated backwards and forwards while working, by means of a handle which folds close up against the body when not in use. There are only three moving parts in the mechanism, and the recommended working speed is from 1,450 to 2,000 r.p.m. The dimensions are 10 in. long by 1½ in. maximum diameter, and the weight is 2½ lb.

Our practical tests included drilling brick and concrete walls for fixing shelves, racks etc., in the " M.E." workshop, and we found that this tool produces neat and correct-size holes expeditiously, without risk of wandering from its intended location, or of damaging the walls. The manufacturers of the tool are Rawlplug Ltd., Cromwell Road, London, S.W.7, and it is obtainable from tool dealers and engineers' supply stores throughout this country.

The Rawlplug drill hammer in use